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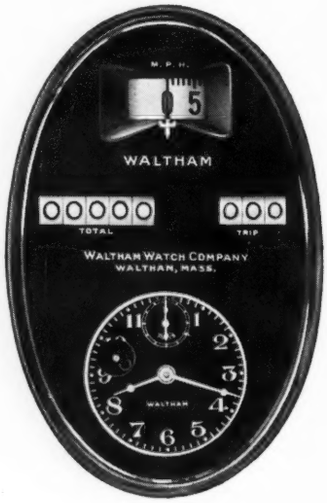

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLV NEW YORK—THURSDAY, JULY 14, 1921 No. 2

Automotive Business Survives Adversity in North Dakota

Despite the elimination of farmer from new vehicle market and handicap of "no credit" attitude of the bankers, cars are running, dealers are keeping sales-rooms open and are well set for the certain revival.

By David Beecroft

WHETHER the Non-Partisan League, the general business depression, the high price of agricultural machinery and living in general, or the adamantine policy of the banker, is directly responsible for the present mental attitude of the North Dakota farmer, the fact remains that he has been practically 100 per cent out of the automotive market since September, 1920, and will not be a buying factor during the remaining months of this year. In fact, it probably will be the spring of 1922 or mid-summer when the farmer is quite certain of 1922 crop figures that he is coming back into the purchasing field in anything like what may become his new standard of buying.

The North Dakota farmer is in anything but a favorable mental attitude toward buying, nor have the big branch houses of the agricultural machinery manufacturers been stocked from basement to roof as this year. Threshing machines and, in many cases, farm tractors fill loading platforms and stations, etc. The farmer is temporarily out of the machinery market. Sales are not 10 per cent of former averages in many sections. Tractor sales are best described as nil. The prospects of a fair crop over the entire State, and particularly in the western part, where there has not been a good crop since 1916, may result in a good sale of threshing machines and a few other necessities, but barring this the farmer is not buying nor is he going to buy if he can help it. He is buying repair parts and doing his own repairing, but he is not purchasing new equipment.

Not only is the farmer sore at the continued high prices of agricultural machinery, but he is ill-tempered all along the line. Last August and September his Non-Partisan League friends urged him not to sell wheat when he might have realized $2 or $2.50 per bushel, and later he sold this wheat at $1.40 or less, if he has sold. The value of everything he had to sell fell so that the index figure for farm products scarcely stood at 117, crops 109, livestock 109, while building material stood at 202, clothing at 181, house-furnishing goods at 262 and fuel and lighting at 194, and metal products at 138.

He cites that his products are not moving to the markets, and that index figures for the movement of his commodities stand far below par, namely, grain and grain products, 91, livestock 80. Farm products are at a low price. Eggs never sold cheaper in the State than they do at present. The North Dakota farmer is not complaining about the present low prices of farm products. He put his crop in at the lowest price basis possible this year. He is satisfied with the present price of wheat and is fully convinced that he can make good money out of his crop, but he is not satisfied with the price of farm machinery. Most of these farmers have no money with which to buy if

the prices were lower, but the almost complete stagnation of sales cannot be entirely laid to the shortage of money.

The tractor demonstration held during three days two weeks ago at Fargo, N. D., exemplified the North Dakota and western Minnesota farmers' state of mind. Twenty-six tractor makers exhibiting 46 tractors and eleven six- and eight-horse plowing outfits staged a 3-day plowing and seeding demonstration and covered the State with publicity, but the farmer stayed at home. On what should have been the biggest day, only 375 motor cars, outside of official cars, were counted at the busiest time of the day. They averaged three persons per car, a grand total of farmer attendance of 1125. Some farmers who were visited after the demonstration was over, said they would not wear out tires, or burn gasoline or buy railroad tickets to see a tractor demonstration this year. Some of them have not the money for railroad fares, or gasoline, and have to conserve their tires.

Yet North Dakota is sound financially. The best bankers in the State declare it is in better condition than many other States that profited by the war, and as a result shared in the inflation and over-expansion, and now must deflate. North Dakota was denied credits, largely due to the Non-Partisan League reputation and activities. In the sale of automotive apparatus very few of the big financing corporations continued to do business in the State, even the General Motors Acceptance Corporation withdrew from the State a year ago.

North Dakota lands have not increased in value. You can get the best land in the State, well improved, at $40 and $50 per acre, excepting in one or two sections very close to the larger cities. There is none of the $500 inflated values of Iowa. In all lines of business, credit was denied during the war and you see no evidences of over-expansion or over-inflation. There is consequently no deflation problem ahead so far as industries in the State are concerned. Farmers in the western part of the State that did not have a good crop since 1916 have not had much chance at war profits. The eastern half of the State has had a good crop each year. The Red River valley occupying the east end, has never missed a crop, but has been subject to the same restrictions of credit that have affected the remainder of the State.

State of Mind Typical

The North Dakota farmer's state of mind can perhaps be considered as typical of the state of mind of farmers in many agricultural states, particularly those which depend largely on one crop, such as wheat, corn, cotton, tobacco, sugar, rice, etc. While the North Dakota farmer has not made the money that the farmers of other states have made, he has not the deflation and the North Dakota farmer is to-day perhaps a year ahead of the farmers in other states. As such, his state of mind is a good one to analyze and his State will serve as a mirror in which we may see conditions a year or 18 months hence as they may be in states that profited by war and inflation and are not yet through the deflation program.

The banker of North Dakota has made the farmer more or less what he is. The banker to-day, without reservation, refuses the farmer credit. He will give him no credit to buy a tractor. It makes no difference how many acres the farmer has or whether the land is free of mortgage or not. The banker has his one rule and one rule only, and that is not to lend. He will not handle farmers' notes for cars, or trucks, or tractors, or isolated houselighting plants, or any kind of agricultural machinery. He has only one line of advice to the farmer, viz.: "Get along with the old, repair it as necessary, but do not buy any new equipment."

Here is a typical example: A farmer in the eastern end of the State who has 320 acres of good land without mortgage and has owned it for 30 years and who, in addition, has $32,000 of his savings loaned in mortgages, etc., wanted to buy a $1900 car and asked his banker to carry his notes in payment of his car until fall. The banker refused. The car distributer took the notes and is carrying them in his own vault. The bank would not discount them.

This is the general attitude of the bankers of the State. The bankers in such cities as Fargo, 22,000; Grand Forks, 15,000; Devils Lake, 5000; Minot, 8000; Bismarck, 6000, and Jamestown, 5000, have funds, but will not lend them. The bankers in the smaller towns and villages have no funds and could not lend if the spirit were willing.

The bankers' attitude has not been improved by the fifty banks that have closed in the last few months, many of them just waiting until crops move and they can get some money from the farmers and re-open their doors. Some of them will not re-open.

He Could Sell

The bankers' attitude has engendered a reaction with farm implement dealers, agricultural machinery branch houses and automotive dealers. One of the biggest of the agricultural machinery manufacturers expressed it best:

> **"I could sell tractors and grain binders if I would take 3-year notes, but I refuse. I am not going to harvest this year's crop for the banker and that is what I would be doing if I sold a grain binder and accepted 3-year notes. The banker is going to take this year's crop. He took one-half of last year's crop and will, if he dares, take all of this year's crop. Let the banker handle the 3-year notes of the farmers for the tractor, or the grain binder, or the threshing machine. Let him harvest his own crop. This banker has a crop mortgage on a great many of the farms. He has had such crop mortgages for years, but he rarely had to execute them. He executed a few last fall, but has given notice he is going to execute many this fall. He is going to get his pound of flesh. This same banker must be careful he does not kill the goose that lays the golden eggs. Machinery is necessary to harvest crops as well as to seed them, and it is hoped the banker will see the error of his ways if he refuses too long to finance the farmer in harvesting a crop now when he has one worth harvesting."**

This epitomizes the general situation in the State. This answers the question why tractors have not been sold this year in sections where many were sold previously, although agricultural conditions are best fitted for tractor use. This tells why tractors have not been used this year; due to shortage of money to buy fuel and the fact that the farmer has horses, that oats are cheap and the banker has told him to use what he has and not buy even kerosene.

From June 20 to July 20 is a period of coma in business cessation in North Dakota. This is the month of crop making or breaking. Business literally stops during this period. The farmer will not buy anything. The banker will not lend. The business man waits. By July 20 the prospect for a crop will be definitely known. The future is uncertain until about July 20. Hot winds before that date may burn the crop white in three days. More crops are ruined in North Dakota in July than any other time. When July 20 is passed and the banker knows what the crop is to be, he is a new man. He is in a position to make loans. He has a definite line on

the business for the next twelve months. The motor car dealer has a knowledge of what he can sell. The farmer has laid his plans. The biggest banker in North Dakota said last week he would discourage a farmer buying anything until the crop for this year is definitely known. He would handle no notes on tractors, trucks, cars, farm machinery or anything else going to the farmer. After July 20 he might make loans if crop prospects are good, and he will not make loans if crops are poor and the farmer has to be financed for another year.

But in spite of all this the North Dakota motor car dealer has carried on. Mortality in his ranks has been amazingly small. Very few sub-dealers have closed shops. The distributers are nearly all in business. The distributer in Fargo, Grand Forks, Devils Lake and Minot tells you his sales are all in the city, none in the country, and yet his country dealers have not gone out of business. They all have repair shops and garages. They sell gasoline, oil, tires and the necessary repairs and accessories. They have reduced overhead to the minimum. They repair tractors, isolated electric lighting plants, trucks, cars, in short, everything that has to be repaired, but they do not sell cars.

Salesrooms Open

Many of them have withdrawn their deposits with the distributers and technically may not be dealers in any particular make of car, but they still have their place of business and are operating. They are ready to go when business revives and the farmer comes back. L. C. Eby Buick distributer in Fargo, cites the case of a dealer in Lisbon, a town of 1800 population in the eastern end of the State, who has not yet taken a 1921 demonstrator, but he is still in business and is healthy and hopeful. Eby has 75 dealers, only 25 of whom have not withdrawn deposits. S. Welch, manager of the Dodge Minot agency, has 58 dealers and they all have garages and repair shops, although this year only two Dodge cars have been sold in the territory. The Overland distributer at Grand Forks, in the eastern end of the State, has 100 dealers, all of whom are in business, but few cars are being sold and sales for the district are scarcely one-twelfth that of a year ago. E. J. Siverson, Studebaker distributer in Grand Forks, with 45 dealers, reports them all in business, although practically all Studebaker sales are in Grand Forks. Mr. Hurst, manager of the Nash agency, with 14 dealers, has only three that have left up deposits, but they are all still in business. Dealers in Devils Lake tell the same story of no country sales and only city business. C. D. Haley, Studebaker dealer for 11 years, has only city sales, but a good country dealers' organization. There is not one of these country dealers that could not sell motor cars if farmer's notes could be handled. The spirit to buy is as strong as ever, but finances are weak.

Motor car dealers in cities, towns and villages of western North Dakota have learned how to live and carry on under the hardest severest school of training—necessity. They have been thoroughly tested and tried. They are happy. They have nothing to worry about. The prospects this year are good. They have learned how to do business without assistance of banks. These dealers are all set for the future. They have come through it all. They know how to convert part of their sales building into a garage and carry the overhead charges. They know how to handle two or three tire accounts and make dollars that way. Some of them have sold tractors for years and know why money can be made from farm machinery. They have practically gone on a cash basis for repairs and have learned how to say no when credit on parts or repairs is asked. They had to finance themselves and did not stock up on used cars. Had banks given them liberal credits they might find themselves stocked with used cars or with too big buildings on their hands or suffering in other ways from over-expansion. The credit to make such possible was denied and they are better dealers for it.

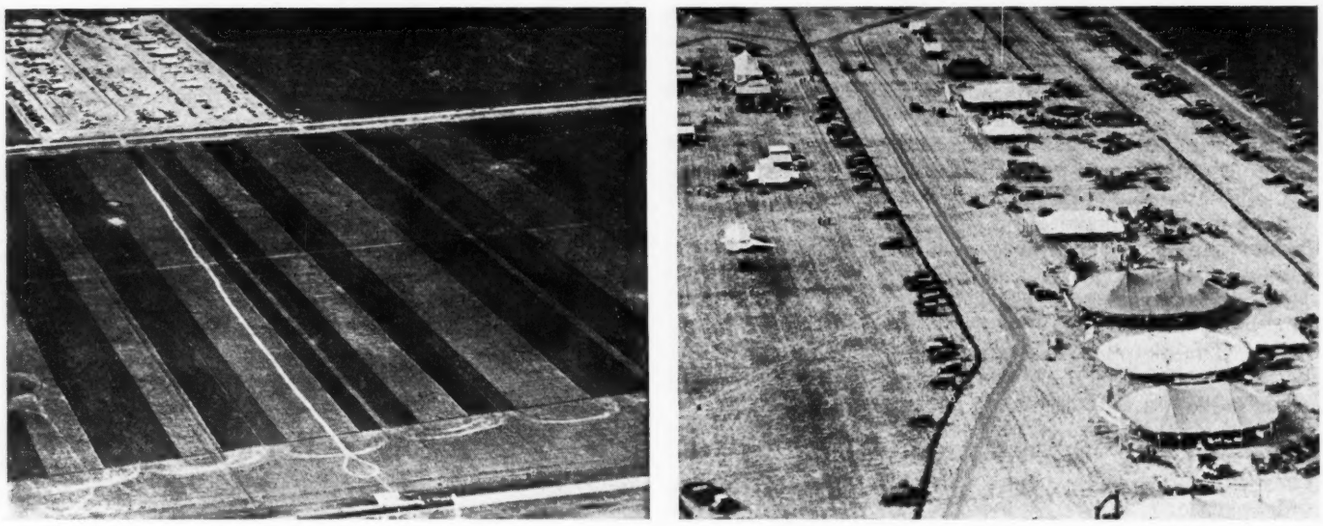
The strenuous character of the times is working a change for the better in many ways. Tire companies that attempted to maintain branches in some cities of 5000 population have closed them and put the tires on sale through dealers. This is becoming general. Some car dealers handle two or three lines of tires. There was not business to warrant a tire branch organization. Tire companies are giving discounts as high as 25 or 28 per cent and the car dealer sees prospects of making money on a tire account, particularly if he is a good merchant and turns his tire stock over six times a year, as he should. The tire companies will maintain warehouse stocks in different centers, but even the number of these can be kept low.

In western North Dakota you do not hear a dealer say he cannot handle different lines, such as cars, trucks, tires, tractors and isolated house lighting sets. He has learned how to do it and also to conduct a garage and repair shop besides. Necessity is ever the mother of invention and holds practically the same relationship to the automotive dealer. No dealer throughout North Dakota or Montana has much of a tire stock on hand. It never was lower. Dealers buy in small quantities. At present mail-order houses, such as Sears-Roebuck and Montgomery Ward & Co., are doing considerable tire business and their lines are cheaper than standard makes. The farmer knows this, but he is short of cash and is content to buy a cheaper article to tide him over until the crop comes in. Once the crop is in, leading tire concerns are looking for a big tire business in this area. There is not a car in the territory but is wearing out its old tires and running short on spares and tubes. Money may be short and there may be none for new cars, but all cars are in use. In one or two places you hear rumors of some cars jacked up in garages, but they are few. There are cases of where tires are worn out and there is no money to buy new ones and cars are laid on the shelf. The use of cord tires, even in Fords, has increased in towns and villages very much.

Old Tractor State

North Dakota is one of the best and oldest tractor states west of the Mississippi. The 77,000 farms in the State have an average acreage of 360 acres. Few farms are smaller than one-half section, 320 acres, and that is a good size for a two- or three-plow tractor. The land is generally level and the soil heavy. Summer plowing for wheat should be done in July and August, months when the temperature is too high and soil too hard for horses. This fact has sold many tractors.

Tractor sales this year have been virtually nil, whereas last year they were good. In Devil's Lake area, Mr. McCullough of Auto State Co., Ford dealer, has not sold a Fordson this year, but sold several last year, and if crops are good expects to make several sales this fall. C. D. Haley, Studebaker dealer, handling I. H. C. tractors, has sold one this year. In Minot scarcely a dozen tractors of all makes have been sold this year. The same is true of Grand Forks and Fargo. In parts of the State many tractors are not being used for lack of money to buy gasoline or kerosene. Most of the two- and three-plow tractors are in use, but one dealer found only one of twenty-four machines of his make in use in a part of his territory investigated. These machines were generally more than three-plow capacity. The farmer's



Two airplane views of the recent tractor demonstration near Fargo, N. D.

thought in not using the tractor is that he has his horses and they have to be fed. Hay and oats are cheap. He has no money to spend for fuel, oil or repairs.

In North Dakota the farmer bought a tractor to take care of the peak load on the farm, and last winter being unusually mild, he was able to do much more fall plowing with horses than formerly, and so the acute spring peak did not materialize. Still the farmer realizes the value of the tractor, and, as one said, that previous to buying his tractor he was not able to get all his fall plowing done, but the first year he had a tractor he fall plowed some of the land twice and the increased yield, or crop, the first year was worth one-half of what the tractor cost. Many of the farmers and most of the bankers have yet to be sold to the value of the tractor. Unfortunately, the banker fails to realize the economic value of the tractor. He fails to realize that its greatest value is making it possible for the farmer to plow when plowing does most good and to plow deeper and faster and thus increase his yield per acre. The banker to-day is dead against the tractor. He sees it only as a substitute too frequently for the horse. He urges the farmer to use the horse.

Repair business in North Dakota is good. Every car is being repaired and the farmers are doing more repair work than they ever did before. Sales of spare parts are normal and mostly on a cash basis. While in a Ford agency a farmer came in and wanted to buy a new car on time. The dealer would not sell him, but sold him parts for his old car. The frankness with which dealers refuse sales in which credit figures is encouraging. It is stimulating. It shows the good that comes out of depression and crop failures.

Garages generally are carrying reduced stocks of parts, and, as one man put it, "We carry only necessities." They have learned what accessories are needed and what ones are not. Brake linings, spark plugs, piston rings, springs, oils, greases, wrenches, tires, tubes, bulbs are typical of what are necessities. The accessory stocks are generally liquid. The shelves are not groaning under a load. Purchases from jobbers are in small lots. Sales are for cash, except where accounts have been carried for years and where payment is made in 30 days. There are repair shops that have been carrying farmers since last July, but they have gotten tired carrying such a load and, by refusing further credit, have found that the average farmer has some cash available.

Truck sales in North Dakota are largely in the four or five cities, with a few in the country. Ford and Dodge jobs are finding their way to the farmers, and the Nash dealer in Grand Forks recently sold a truck to a potato farmer living nine miles out. Farmers are coming to realize that when they live ten or more miles from the railroad depot the truck becomes a real instrument.

George Dixon, Reo dealer in Grand Forks, looks for good truck prospects this fall, many of which will be farmers. W. A. MacMillan, manager of the Pence Co., Buick distributor in Fargo, has sold but six trucks since January 1, and not one in the last six weeks.

Most North Dakota roads are black gumbo and the main routes are well graded and dragged. In dry weather the surface is good, but the roads are impassable in wet times. The motor truck appeals to the North Dakota farmer, due to the short season he has for work. His situation is very different from that in Texas and Kansas, where the farmer has long seasons. In North Dakota the ground freezes in October and by that time he must have his fall plowing and threshing done and his grain delivered to market. He has an acute peak period, and the tractor and truck will be two essentials in his prosperity. He must not be allowed to buy too large a truck. From 1-ton to 1½- or 2-ton appear to be best suited. He may want more, but tear a page from the experience of the eastern farmer, who has found that a 1½-ton job is a better investment than a 3-ton job. The small pneumatic tire, not over five inches, has advantages in the country roads over trucks carrying seven- and eight-inch sizes, where the sides are worn out too quickly in ruts.

Sales of isolated house lighting plants have been slow for the past year, and practically none are moving now. Mr. Ashleman, Delco distributor for North Dakota, has recently disposed of his electrical equipment business, such as chandeliers, coffee percolators, bulbs, flat irons, etc. In fact, the Delco policy has been altered in this regard. For a time the sale to the farmer of this equipment was looked upon as a big part of the business, but difficulties developed. The regular electrical supply dealer of the town, who a few years ago did not have any realization of this new industry, has recently seen the possibilities of business and has resented the sale of equipment by the Delco or other dealer. Then, too, the distributor has had the problem of financing his dealers to a large extent in this equipment field. The dealer can now concentrate on sales of lighting plants and a few major equipments, such as pumps, washing machines, etc.

Service on these isolated lighting units has been a problem, and Willys light has reduced the free service period from one year to 90 days. After that the farmer pays at an hourly rate for service work. Some Willys light dealers are discontinuing the sale of miscellaneous equipment and concentrating on the lighting unit. Not all dealers are giving service. In some areas several Delco dealers do not give service and operate on a lower sales discount basis. Service in such areas centers on one large dealer, fitted to give service for the territory. The sale of lighting outfits through hardware stores is waning. Many garagemen and car dealers make good salesmen, and the garageman is especially well fitted to give service.

General conditions in four of the leading centers of North Dakota may be summarized as follows:

Fargo, in rich Red River Valley area. Car sales are 20 to 50 per cent of last year, Fords not included. Price reductions have greatly aided sales, which are nearly all in city and few in country. Western part of Fargo territory has had crop failures for two or three years. Over a dozen Fargo dealers, several of the curbstone type, have gone out of business in the last year. Fifty to 80 per cent of sales in Fargo are on time payment. J. D. Grant, accessory jobber, reports accessories selling well in eastern half of State and western Minnesota. He has five traveling men instead of seven. Payments are in 90 days; used to be 30 days. The eastern part of State is sound, but hard up. Over 80 per cent of farmers have motor cars.

Grand Forks. City business is good; no business in the country. Farmers are doing their own repairing. Studebaker sales 85 per cent of last year. Ford sales slightly under last year, but parts sales are 100 per cent. Several new repair shops have started. No truck sales, and many large tractors were not used this year. Price reductions greatly stimulated sales. Dodge and Buick have few sub-dealers out of business. No distributors have quit business. Nearly 90 per cent of the farmers have motor cars.

Devil's Lake. Ford sales are practically equal to last year's. No truck sales; tractors slow. Farmers are doing most of their repairing. Studebaker sales in the city are good. Local banks are sound. General business in Devil's Lake is 50 per cent of normal. Farmers are starting to buy trucks. Several dealers sell tractors, along with cars, tires, etc. Farmers in this community are wealthy and own their land. Nearly 100 per cent of farmers have motor cars.

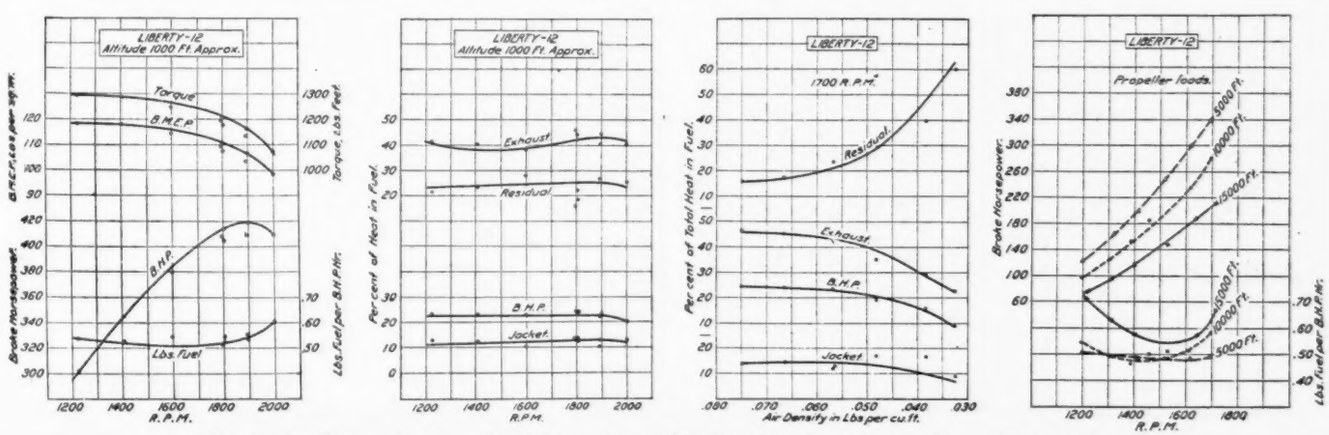
Minot. Crop conditions within a radius of 10 miles are poor. Crop burned last week. Thirty-eight banks failed in this territory, which has not had a good crop for five years. Sales are in cities only. Few tractor or farm implement sales are reported. No truck sales. More car sales, after price reductions, than for eight months previously. Repair business was good until July 1, when it became slack. Few sub-dealers are out of business. Firms that sold 20 trucks last year have sold but one this year. Ford sales are ahead of last year, but sales are only in cities and towns. No cars are laid up. Repair business and tire sales are largely cash. Dealers sell tires, accessories, tractors, etc.

Performance of the Liberty Engine

EXTENSIVE tests of the Liberty twelve-cylinder aircraft engine under varied conditions have recently been made in the altitude chamber of the Bureau of Standards at Washington, and the results obtained published in Report No. 102 of the National Advisory Committee for Aeronautics. The object of the test was to determine the performance of the Liberty engine under such conditions as would yield sufficient information to determine its value for aviation use. A number of the performance charts are reproduced herewith. All the conditions of the tests are indicated on the charts. It may be pointed out, however, that the residual heat is the difference between the heat value of the fuel consumed on the one hand and of the heat equivalent of the horsepower output, the exhaust heat and the jacket heat on the other. This factor therefore includes the heat value of the unburnt fuel. As the fuel requires 15.3 lb. of air per pound of fuel for its complete combustion and the leanest mixture contained only about 14 lb. of air per pound of fuel, it is clear that some of the fuel must always pass through the engine unburned or only partially burned.

The greatest value of such data as furnished by this test can be realized only by its comparison with similar results obtained with other engines. This not only permits of the engines being judged as to their relative value for a given class of work, but also indicates reasons for superiority in performance of one type over another.

There are two outstanding conclusions, however, to be drawn from the test itself—namely (1) that the carburetor control is inadequate above 15,000 feet and (2) that the most promising line of development for improved altitude performance lies in increased mechanical efficiency through decreased friction horsepower, and in such changes as will prevent the decrease in volumetric efficiency.



Charts showing performance, heat loss, etc., of Liberty aircraft engine under various conditions

One Four and One Six-Cylinder Chassis Comprise Benz Line

Aside from engine, chassis are practically identical, and possess but few novel features. Transmission brake has provision for water cooling. Steering gear has unhardened screw with non-adjustable babbitt-lined nut. Torque tube and radius rods preferred to Hotchkiss drive.

By Benno R. Dierfeld

At the present time the Benz company is manufacturing two chassis models, a four and a six, of 45 and 70 hp. engine rating, respectively. It is natural that a design with 36 years of experience in the automobile business behind it does not need to be changed very often, hence an annual model is not a feature of the Benz program. The two models here considered are practically identical except as regards the number of cylinders and the rear spring suspension, which latter is of the cantilever type in the six and the half elliptic type in the four-cylinder model.

The engine drives through a cone clutch to the four-speed transmission, which forms a separate unit. The propeller shaft has a single universal joint, and the rear axle is provided with radius rods. The rear axle drive is by bevel gears. Steering gear and control levers are arranged on the right-hand side. One brake acts on the transmission, the other on the two rear wheels. The frame is in-swept at the front and has a kick up at the rear. The fuel is pressure-fed from the rear tank.

The L-head cylinders are cast in pairs as will be seen from Fig. 1. The valves have aluminum cover plates and the camshaft is driven by an easily adjustable chain which also drives the high tension magneto. The starting motor and generator are mounted on cast brackets on the crankcase arm. The water pump is driven by the same shaft as the magneto. Carbureter air is pre-heated in a sleeve surrounding the exhaust pipe; furthermore, the inlet manifold is heated by water from the jacket header. The aluminum crankcase is divided horizontally and has in its upper part three babbitt bearings for the crankshaft, which are offset 15 mm. from the axial plane of the cylinders. See Fig. 3. The pistons are of cast iron and the big ends of the connecting rods have babbitted bearings. Between the two cylinders of each pair a cast passage is provided, connecting the inlet manifold with the inlet valve chamber on the opposite side of the engine, thus insuring good preheating of the fresh mixture. See Fig. 2. The two inlet valves of each cylinder pair are located between the two exhaust pipes. To prevent rattle the ends of all valve tappets are provided with inserts of vulcanized fiber.

The carbureter is of the Benz-Zenith type. On the four cylinder models fuel feed is by exhaust gas pressure and when the engine is at rest the necessary tank pressure can be produced by a hand air pump on the steering post. In order to maintain a constant pressure on the fuel tank a pressure regulating valve, a sectional drawing of which is shown in Fig. 4, is used. The device consists of two valves, A and B, located one above the other in a common valve housing. The exhaust gases enter through strainer J and valve A, whose spring F has but little tension. By adjusting the tension of valve spring G the pressure in the fuel tank can be regulated. On the six-cylinder model a small engine-driven air pump furnishes compressed air for fuel feed and no exhaust pressure device is required.

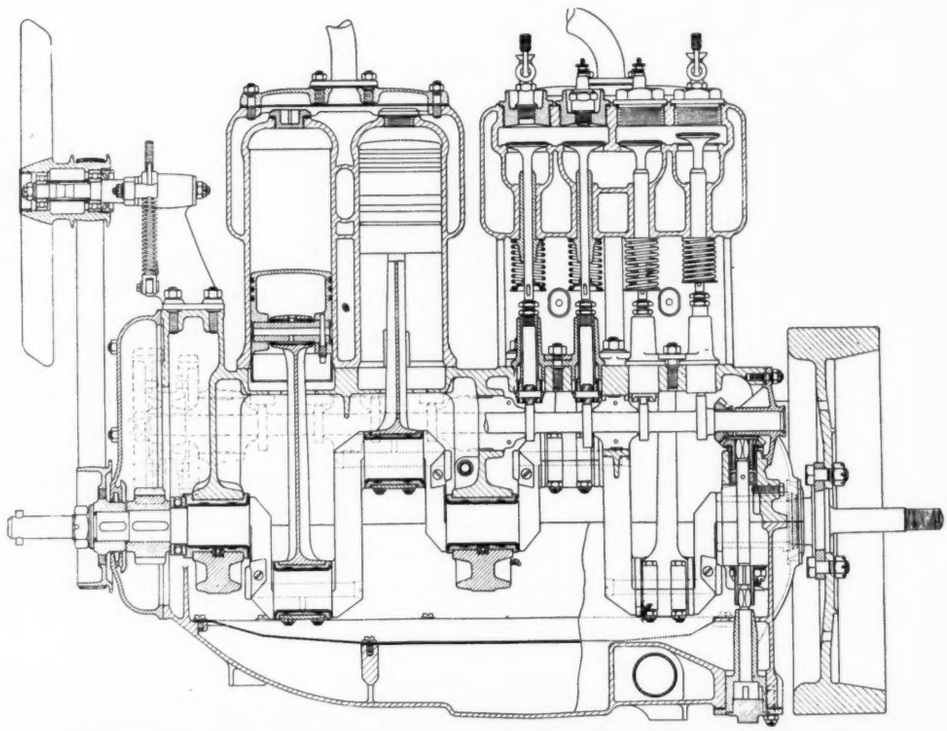


Fig. 2—Longitudinal section of Benz 4-cylinder engine. Note inlet passage cast between cylinders of each pair

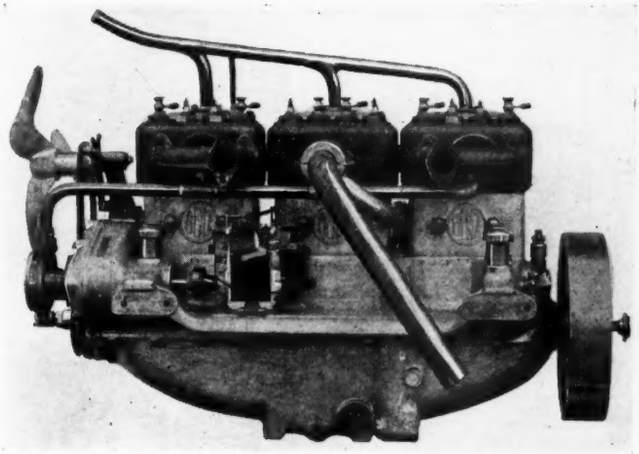


Fig. 1—Exhaust side of Benz 6-cylinder engine. Note location of water pump, peculiar shape of fan and fan adjustments

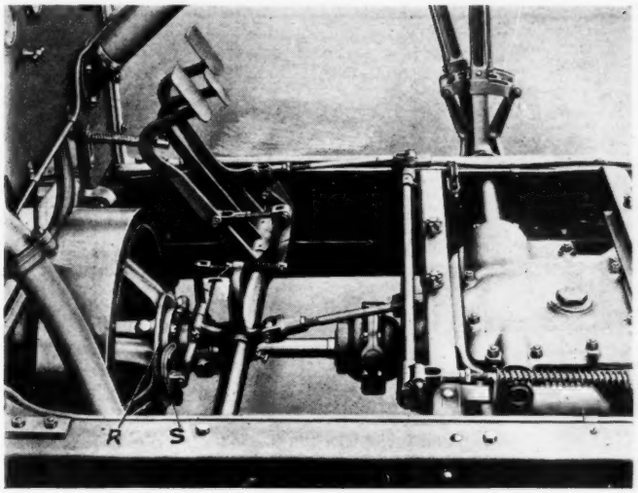


Fig. 9—View showing clutch and brake controls, method of mounting gearbox, etc.

Ignition is by high tension magneto and battery with one set of spark plugs.

The tubular radiator is connected flexibly by a ball-shaped trunnion to one side of the frame, in order to avoid stressing the radiator core. The pump is of the centrifugal type and the fan is belt-driven from the crankshaft. The fan shaft runs on ball bearings and is supported on a stud carried on the short arm of a double armed lever. The fulcrum of the latter is supported by a cast bracket. Secured to the long arm of the lever is a coiled spring with a butterfly nut, seen in Fig. 1, by which the tension of the fan belt can be easily adjusted. A grease cup provides lubrication for the fan shaft bearing.

Engine lubrication is effected in the following manner: From the sump A, Fig. 5, the oil flows through a strainer to the oil pump B, which forces the oil through pipe C to the main oil tube D. The latter runs parallel with the crankshaft inside the upper crankcase half.

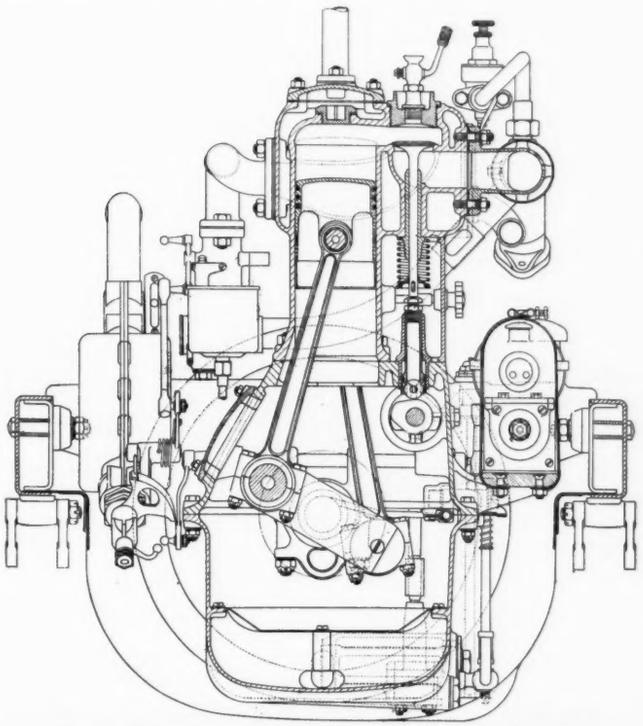


Fig. 3—Transverse section of engine. The crankshaft is offset

Three branches lead to the crankshaft bearings, the branch H to the magneto shaft and the branch E to the oil pressure gage on the dash. Oil working its way through the crankshaft bearings flows along the shaft webs to the oil pocket J, whence it is forced to the big end bearings by centrifugal force and lubricates the pistons and cylinder walls in the form of a spray. On both sides of the camshaft there is an oil pocket O which collects a part of this oil spray. Oil thus collected is led through suitable passages to the camshaft bearing surfaces. The piston pin bushing is connected by a drilled passage with the interior of the hollow piston pin and the oil necessary for its lubrication is wiped off the cylinder walls. The excess oil, running down the crankcase walls, flows back through the large strainer K to the sump A. The chains used for the camshaft and magneto drive are lubricated by an oil jet coming from a fine hole G in the tube D.

In order to regulate the quantity of oil pumped to the main oil tube, oil pressure valve P is provided on the crankcase arm. It is connected by tube R with the main oil tube D and is shown in detail in Fig. 6. Valve V is held to its seat by the spring F, the tension of which can be regulated by the set screw S secured with a lock nut. As soon as pressure in the main distributing line exceeds a certain set valve the valve V opens and the superfluous oil flows back through passage Q to the crankcase. In order to prevent unauthorized adjustment of the oil pressure valve, it is provided at the factory with a cap which is secured by a lead seal. The height of the oil level in the crankcase is regulated by means of the three-way cock L, Fig. 5. The oil filler tube also serves as a breather. M is the drain plug, which is connected with a cylindrical strainer.

Fig. 7 shows two sectional views through the pump. The pump shaft N is driven by the intermediary shaft M and the bevel gears from the camshaft and bears on its lower end the slotted member K, forming a guide for blade B of the vane-type oil pump. The pump chamber is closed by cover L, upon the removal of which the pump with drive can be removed.

The clutch cone is of pressed steel in the 45 hp. model and has a leather lining. It is pressed into the flywheel by the clutch spring D. Declutching is effected through the pedal, lever H, Fig. 8, and two shackles G. The spring sleeve C is lubricated through the oil screw F. The clutch shaft is connected with the transmission main shaft by the intermediary shaft M and the enclosed universal joint N. A simple clutch brake, shown in Fig.

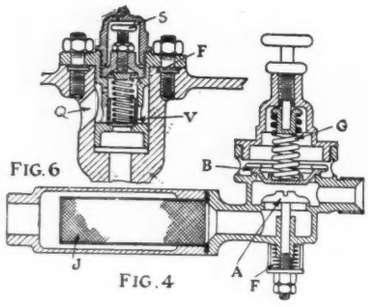


FIG. 6

FIG. 4

Fig. 4—Fuel feed pressure valve, operated by exhaust.

Fig. 6—Oil pressure regulating valve.

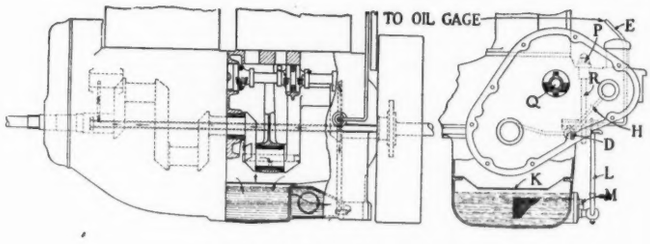


Fig. 5—Lubricating system

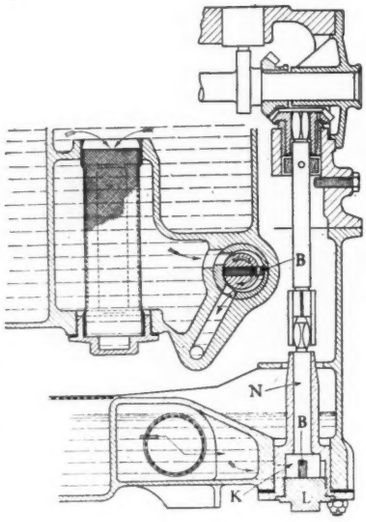


Fig. 7 — Sections through oil vane-type pump, showing driving mechanism, strainer, etc.

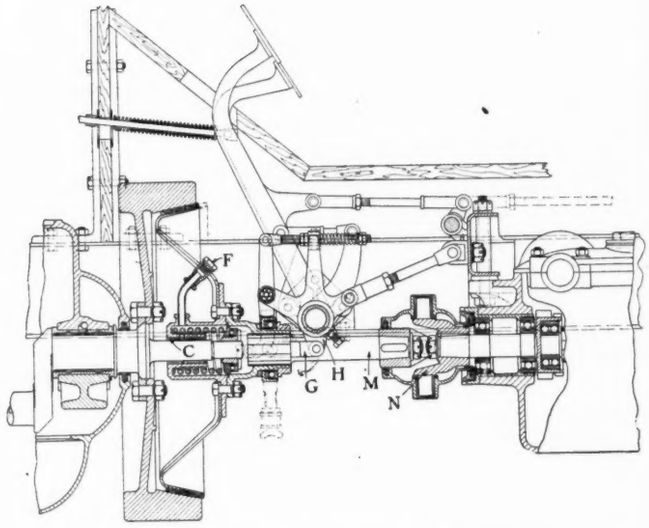


Fig. 8—Sectional view of clutch and adjacent units

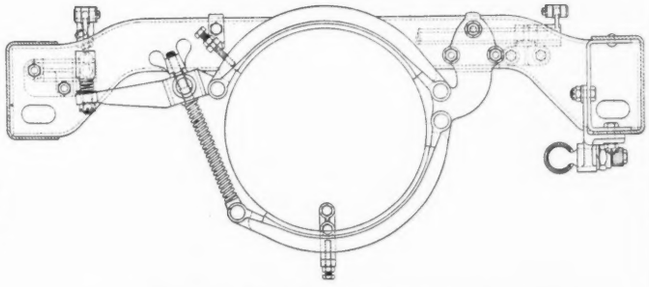


Fig. 11—Transmission brake anchored on transverse frame member. Provision for water-cooling the brake is made.

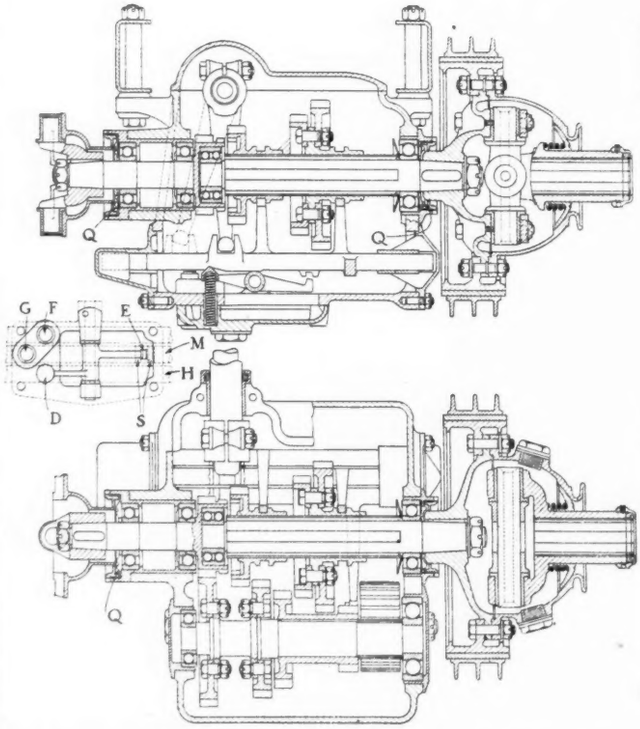


Fig. 10—Sectional views of gearbox and universal joint.

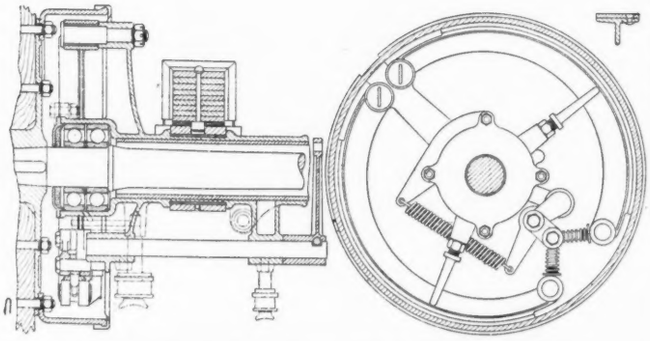


Fig. 13—Axle-end and rear wheel brake mechanism

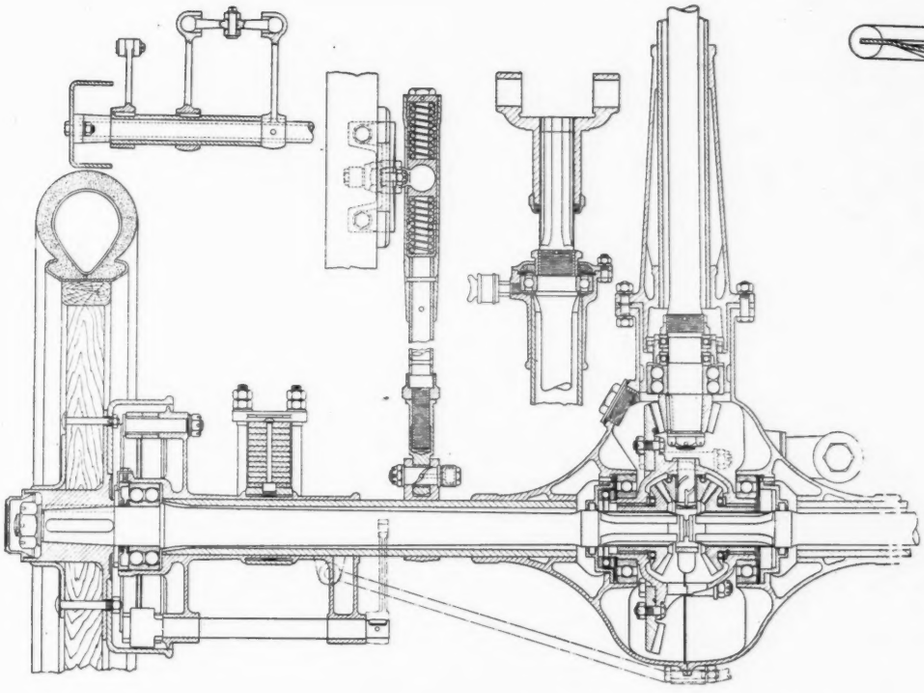


Fig. 12—Horizontal section through rear axle, propeller shaft, torque tube and radius rod. Brake equalizer is shown in upper left corner

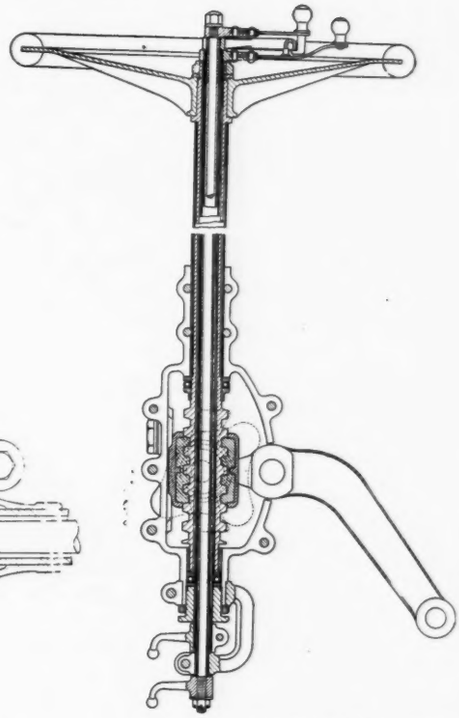


Fig. 14 — Longitudinal section through steering gear

9, is provided. It consists of two leather-lined brake shoes S, pressed by a spring against flange R of the clutch cone, this brake can be adjusted by loosening the lock nut T and turning the adjacent nut. In the 70-hp. model the clutch cone is made of cast aluminum.

The gearbox, shown in section in Fig. 10, has four forward speeds. All transmission shafts run in ball bearings. When the reversed gear is engaged the gear shift rod M is secured in its position by a locking device. By moving the gear shift rod H to the left side, the nose D of a two-armed lever is pressed down, the other end E of which then is moved upward, thus entering between the two projections S of the shift rod M and locking it. The shifter rods are locked by the two set pins, F and G. The bearings of the transmission shafts are made dust and oil tight by spring disks of bronze, Q, which are pressed by screw rings against the outer and inner race of the corresponding ball bearing.

The design of the cross pin universal joint is clearly shown in Fig. 10. The rear part of the case has two diametrically opposite screw plugs for lubrication and a pulley for the speedometer drive. This form of speedometer drive is preferred to the front wheel drive, because it is protected against mud and no provision needs to be made to compensate for the spring action.

Oil leakage from the universal joint cases is prevented by a ball sector-shaped piece pressed by a spring against the spherical interior surface of the case and a felt ring held by a screwed retainer.

The transmission brake drum is bolted together with the forward part of the universal joint case. The brake shoes of steel have cast iron linings and their right ends are swiveled to a bracket bolted to the transverse frame member. See Fig. 11. The other ends are operated by a lever and bolt. When the linings become worn slightly the shoes can be adjusted by a butterfly nut. After more extensive wear the brake rod is shortened by screwing up the yoke. In case of unequal distance of the brake shoes from the drum, the lock nuts of the two screw J, K are loosened and the screw adjusted accordingly. To prevent undue heating of the transmission brake, a water tank is provided at the right side of the transmission case from which cooling water is forced by exhaust gas pressure to the sight feed with stop cock at the dashboard, whence it is allowed to flow to the brake drum. The brake shoes also have cooling ribs on the outside.

A horizontal section through the drive shaft and rear axle is shown in Fig. 12. Two parallel radius rods serve to transmit the propulsive effort from the rear axle to the frame. They have an eye at the rear end supported by an axially drilled pin with provision for grease lubrication. The front end has a ball joint spring-cushioned to damp out road and starting shocks. This joint is lubricated with grease through a drilled pin. The rear wheels can be detached after removing the axle cap and axle nut by inserting a wheel puller in place of the cap.

The design of the rear wheel brakes is clearly shown in Fig. 13. Inside the brake drum are the two brake shoes lined with asbestos fabric and carried on two pivots. The free ends are connected by toggles and a link with a lever arm. Equalization of the two rear brakes is effected by means of the simple ball-headed balance lever arrangement, shown in Fig. 12. When the brake shoes are worn adjustment can be made in the brake linkage, but it can also be made on the brake itself, after removing the rear wheel, by loosening the check nuts and lengthening the toggles.

A longitudinal section through the steering gear is shown in Fig. 14. By means of the steering wheel, motion is given to the long unhardened steel screw and the babbitted non-adjustable nut. This screw and nut arrangement is said to have proven entirely satisfactory. The throttle and spark levers are arranged in the usual manner.

The front axle, Fig. 15, has forked ends and the steering knuckle pivot has plain bronze bushings with ball thrust bearings. The front wheel hub has ball bearings and is closed on the inside by felt rings and metal washers.

In the following table are given some particulars and dimensions of the two Benz cars:

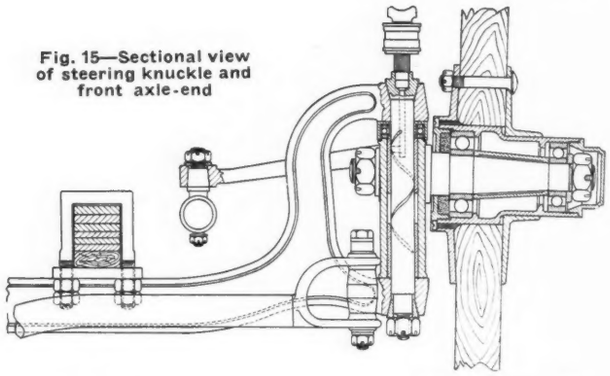
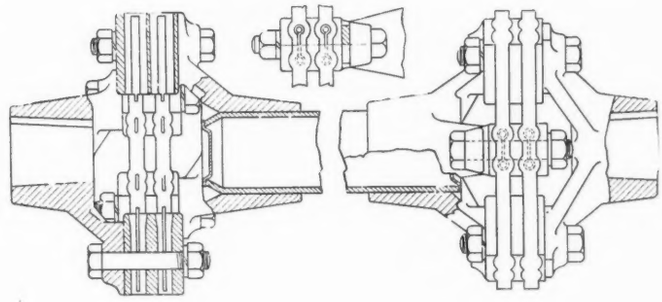


Fig. 15—Sectional view of steering knuckle and front axle-end

Brake hp.	45	72
Cylinder bore, millimeters	100 (3.94 in.)	100 (3.94 in.)
Cylinder stroke, millimeters	150 (5.90 in.)	150 (5.90 in.)
Number of cylinders	4	6
Revolutions per min.	1650	1550
Compression ratio	4.15	4.06
Weight of engine	596 lb.	826 lb.
Body length of frame	108 in.	108 in.
Wheelbase	134 in.	144 in.
Tread	55 in.	56.5 in.
Chassis length over all	182 in.	194 in.
Chassis width over all	68 in.	70 in.
Width of frame	34 in.	35.5 in.
Height of frame above ground	24.2 in.	24.4 in.
Ground clearance	10 in.	9 in.
Chassis weight with tires	2640 lb.	3200 lb.
Tires	935x135 mm.	935x150 mm.
Speed	51 m.p.h.	59 m.p.h.
Capacity of fuel tank	20 gal.	37.5 gal.
Fuel consumption	11¾ m.p.gal.	8.5 m.p.gal.

A New Fabric Universal Joint

IN the past some trouble has been experienced with fabric type universal joints from the bolts loosening and the fabric around the bolt holes being torn or worn out in consequence. In the M. & E. Griptite, a new design, it is sought to overcome this difficulty by embedding six tubular steel spreaders in the disks, one at each bolt hole, these spreaders bulging the fabric into semicircular ridges exactly fitting the formed clamping washers. The spreaders are in contact with the bolts and impart to them part of the torque from the disks. They are also claimed to increase the density of the rubber immediately under the clamping washers, thus allowing greater initial clamping pressure on the disks and reducing the need for retightening to a minimum.

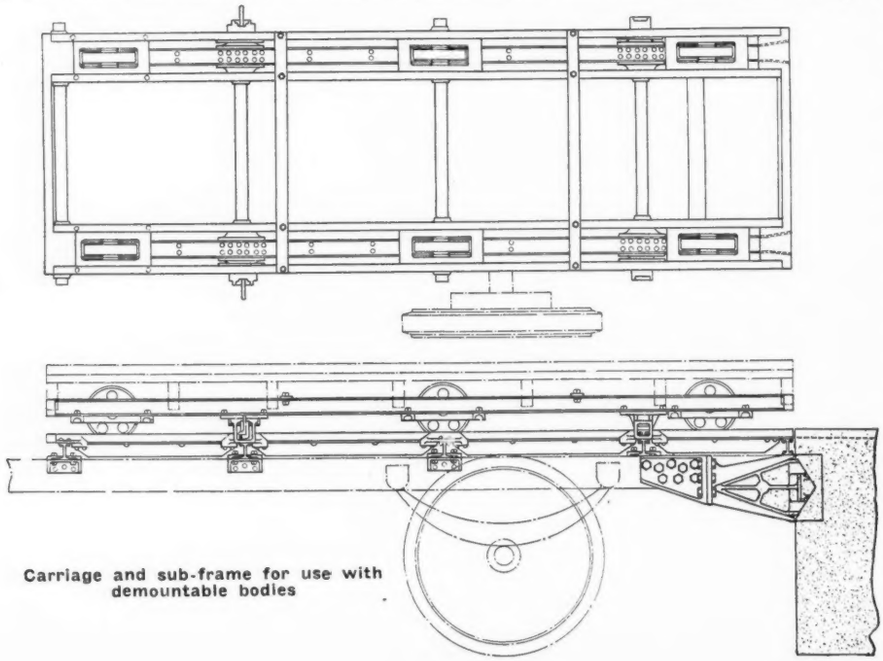


The M. & E. Griptite universal joint

A Demountable Body Carriage

THE demountable body carriage outfit for truck use, shown in the accompanying cut, consists of one subframe, two carriages and two sets of wedge-blocks. Separate units can be added as they are needed. The parts are of steel construction throughout. Channel irons which serve as rails for the steel wheels under the carriage to roll on are sunk level with the floor and do not prevent the use of hand trucks on the shipping platform.

The sub-frame is of steel construction, with a channel steel track, the whole being fitted to the chassis by brackets bolted through the sides of the frame. It is made to fit any length and width of chassis. There are four locks, two on each side, which keep the carriage and body in place on the chassis. It is said to have been proven in service that the bodies cannot come off accidentally. The carriage, which can be mounted under old as well as new bodies, is of a construction similar to the subframe. It has steel wheels fitted with roller bearings, which make the body easy to roll when unlocked. It is said that two men can easily push a body loaded with 2½ tons, and five men 7 tons. The leveling device consists of the wedge-blocks mounted on the platform front and the V-blocks on the rear of the chassis. Backing the truck into the wedge-blocks always brings the body to the same level, no matter whether empty or loaded and locks it there until the body is shifted. The roll-off carriage and accessories necessary for use with it are manufactured by the Perrin Automotive Engineering Co.



Carriage and sub-frame for use with demountable bodies

Experiments With Localized Charge and Supercharging Engines

Report of investigations demonstrating how mean effective pressure and economy can both be increased by use of stratified charge. Excess air and cooled exhaust gas are employed as diluents to limit maximum temperature of cycle and prevent detonation. Unusually high fuel economy at part load is obtained by use of non-throttling engine.

By Harry R. Ricardo*

IF we consider the usual four-stroke cycle, we find that there are only two obvious ways of increasing the power output, namely, by increasing the mean pressure, or by increasing the piston speed. The former does not leave much ground for hope, for the volumetric efficiency is already within 1 or 2 per cent of the highest obtainable, and the compression ratio has already been carried to the highest safe limit consistent with the fuels available. Moreover, a little investigation will show that any further increase in compression must result in a very large increase in the maximum pressure, involving the necessity for heavier moving parts; hence such increase of efficiency as might be obtained by increased compression will be largely counterbalanced by enhanced mechanical losses due to the heavier masses.

So far as piston speed is concerned, there does not appear to be very much hope either. Until recently the piston speed was controlled primarily by the inertia of the reciprocating masses, but since the advent of the aluminum piston the controlling factor has been shifted to the valve gear and the provision of adequate valve area. By careful design, the limit can no doubt be still further raised, but only at the expense of greatly increased cost of manufacture. Again, if either the mean pressure or the piston speed could be increased, another controlling factor would play havoc, namely, the difficulty of dealing with the intense heat flow, which is already a serious problem, even in the smallest engines. This difficulty can be alleviated to some extent by the use of aluminum piston and cylinder head and water cooled exhaust valves, but it cannot be altogether avoided by such means, and when staved off in one direction it soon crops up in another. In whatever way the problem may be viewed, the conclusion is invariably reached that in order to obtain any really substantial gain in power or economy, the question of heat flow must first be attacked, and some means or other must be found to reduce the flame temperature. In this direction lies not only the one hopeful solution of increasing the power, but also the one chance of a really substantial gain in economy, since the two principal losses, namely, the loss due to direct transfer of heat to the cylinder walls, and the even larger loss due to the increase in the apparent specific heat of the working fluid at high temperatures, are both directly dependent upon the maximum flame temperature.

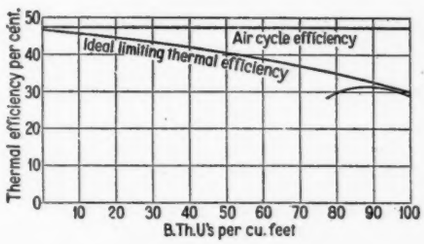


Fig. 1—Relation between air cycle and ideal efficiencies and heat added per cu. ft. of mixture. Compression ratio 5:1

If we consider the working fluid from the point of view of an air to gasoline mixture, we find that the proportion giving complete combustion has a heat value in round numbers of 100 B.t.u. per cu. ft. With this mixture density, the combustion of the fuel will raise the temperature of the working fluid to approximately 2500 deg. C. (4532 deg. Fahr.), taking into account the increase in the apparent specific heat and dissociation. At this high temperature the loss of heat, and still more the loss due to the increase of specific heat at high temperatures, are extremely serious.

The air standard efficiency of the cycle is independent of the maximum temperature, so long as the gases are expanded to the same vloume as they occupied before compression, but this holds good only when there is no loss of heat, dissociation, or change in the specific heat of the working fluid. When, however, these considerations are taken into account, it will be found that the ideal efficiency falls rapidly as the temperature rises.

In Fig. 1, one curve shows the theoretical efficiency obtainable with a compression ratio of 5:1 on the assumption of no heat loss, no dissociation and constant specific heat; this curve is a straight line, and is independent of the flame temperature or heat value of the mixture. The other curve takes into account the loss due to change of specific heat, and also allows a minimum figure for the jacket loss, and it will be observed that as the heat value of the mixture, and therefore the flame temperature, is reduced, the efficiency rises until, at the point of no heat supply, it would become equal to the air cycle efficiency.

Consideration of this curve shows at once the desirability of working with a weak mixture, and therefore a lower flame temperature, but unfortunately gasoline vapor has only a very narrow range of burning, and so long as the mixture is homogeneous it is not possible under ordinary conditions to employ a mixture weaker than about 85-90 B.t.u. per cu. ft. At this strength the maximum flame temperature is but little lower, since the first effect of reducing mixture strength with gasoline is to reduce the proportion of dissociation and so affect the temperature but little. Any attempt to work below this density

*Slightly condensed from a paper presented before the (British) Institution of Automobile Engineers.

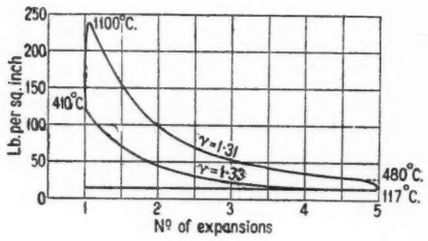


FIG. 2

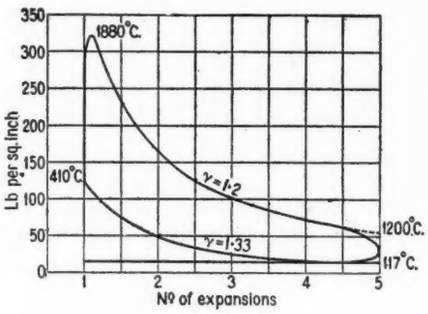


FIG. 4

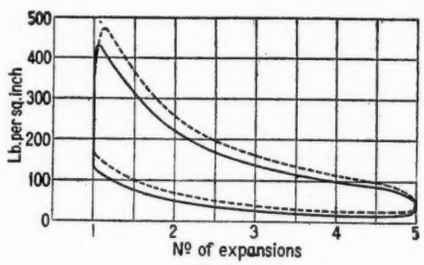


FIG. 5A

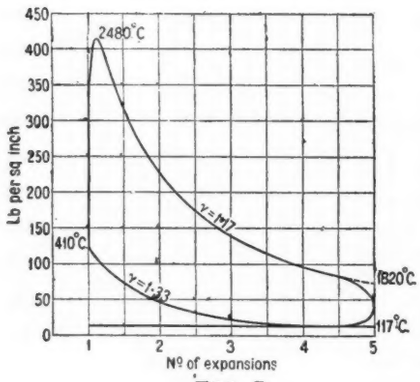


FIG. 3

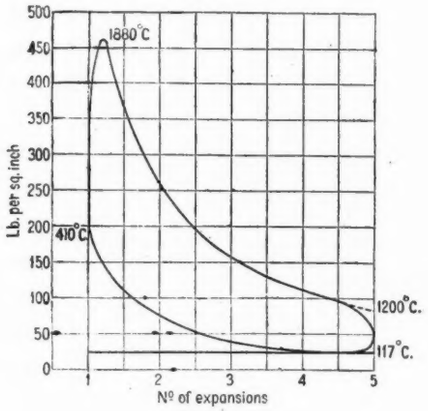


FIG. 5

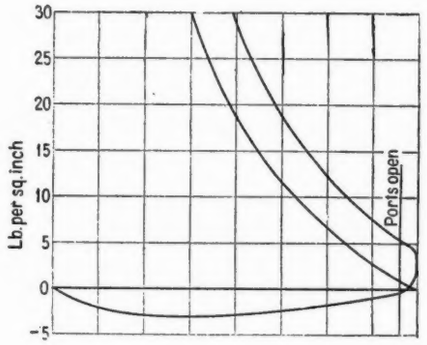


FIG. 13

IDEAL INDICATOR CARDS FOR VARIOUS CONDITIONS

Fig. 2—20 B.t.u. per cu. ft. Fig. 3—90 B.t.u. per cu. ft. Fig. 4—66 B.t.u. per cu. ft. Fig. 5—66 B.t.u. per cu. ft. plus 33 per cent supercharge. Fig. 5A shows Figs. 4 and 5 superimposed. Fig 13—Light spring diagram, showing admission of supercharge

with a homogeneous charge results in incomplete combustion, and ultimately so slow a rate of burning that flame lingers in the cylinder and ignites the fresh charge on entry, causing the familiar popping back through the carbureter.

It is evident that were it found possible to work with a much weaker average mixture density, and so obtain a very substantial improvement in thermal efficiency, the mean pressure would be reduced, though not in direct proportion to the heat value of the mixture, because the higher efficiency obtained would mean that a greater proportion of the available heat would be converted into power.

To appreciate the effect of working with a low mean mixture strength it is interesting to consider what would happen if into a cylinder containing nothing but pure air, a paper bag containing a small proportion of fuel and air of normal mixture strength were inserted, and that by some means the contents of this bag were ignited at the end of the compression stroke. The bag would immediately burst, and the burning mixture would be projected into the large excess of air present in the cylinder, thereby heating the air and raising its pressure. The average temperature of the air under these conditions would of course be much lower than if it were saturated with fuel; on the other hand, if the same quantity of fuel had been allowed to mix with the whole of the air it would not have ignited at all.

Fig. 2 shows the sort of indicator diagram which would be obtained supposing that the contents of the paper bag represented 20 per cent of the total cylinder volume, the remaining 80 per cent being either pure air or air and exhaust gas. It will be observed that the maximum flame temperature would in this case be only about 1100 deg. C. (2012 deg. Fahr.). With such a maximum temperature the loss of heat to the walls and the loss due to change of specific heat would be very small, and the efficiency would be very high in consequence. The theoretical efficiency would under such conditions be just under 45 per cent for a compression ratio of 5:1.

In the experiments described later in this paper the author aimed at—

1. Reducing the mean mixture strength by stratifying the charge and so obtaining a high thermal efficiency.
2. Reducing the heat flow by lowering the flame temperature.
3. Recovering and even increasing the mean pressure by the addition of extra air in the form of a supercharge.

In Figs. 3, 4 and 5 are shown three indicator diagrams which illustrate the objects in view. Fig. 3 shows a normal diagram for the most economical mixture strength with a homogeneous charge, namely, about 90 B.t.u. per cu. ft. This diagram shows a maximum temperature of about 2500 deg. C., a limiting efficiency of 32 per cent, and a mean effective pressure of 138 lb. per sq. in. indicated.

Fig. 4 shows a diagram for a mean average mixture strength of 66 B.t.u. per cu. ft. In this case the maximum temperature will be about 1880 deg. C., the efficiency 34.5 per cent, and the mean effective pressure 98.5 lb. per sq. in.

Fig. 5 shows a diagram also for a mean average mixture strength of 66 B.t.u. per cu. ft., in which the weight of air has been increased 33 per cent by means of supercharging. The effect of the supercharge will be to enlarge the whole diagram by 33 per cent without affecting the temperature and, therefore, the efficiency, but increasing the mean pressure to 152 lb. per sq. in. Under these conditions, not only will the high efficiency theoretically obtainable under the conditions of Fig. 4, be maintained, but the mean pressure will be restored and even raised to well above that obtainable under normal conditions of working.

The experiments may be divided into three phases.

1. An investigation into the efficiency obtainable by varying the mixture strength under normal conditions.
2. An investigation into the possibilities of reducing

the mean mixture strength by working with a stratified charge.

3. Experiments combining the use of a stratified charge with supercharging.

For the first series of tests a highly efficient single-cylinder vertical engine, direct-coupled to a swinging-field dynamometer, was used. The engine was provided with a Hopkinson optical indicator and a carbureter in which the whole of the fuel was thoroughly vaporized, and in which the control of the fuel supply could be regulated with extreme nicety by means of a very fine needle valve. The accuracy of the apparatus was such that the power could be read with certainty to within ± 0.3 per cent, and the fuel consumption to within ± 0.5 per cent. Very careful determinations were also made of the mechanical and pumping losses, so that the indicated power could be arrived at from the brake horsepower, and also checked by indicator diagrams which were taken at frequent intervals.

A summary of the results of these tests is shown in Fig. 6 which explains itself. It will be observed that so soon as the mixture strength is reduced to any substantial extent beyond that at which there is just sufficient air to combine completely with the whole of the fuel, incomplete combustion counteracts any gain in efficiency due to the reduced flame temperature. Unfortunately, however, the absolute mixture strength could not be definitely determined because no means were available of measuring accurately the air supply; consequently the curves showing the actual performance may be as much as ± 2 per cent out in a horizontal direction.

The second series of tests, which was carried out during 1913-1914, was undertaken with a view to determining:

1. Whether it was possible by means of stratification to work with a low mean mixture density.

2. Whether, if it were possible to do so, the results obtained would be found to be in agreement with those theoretically possible, or whether any disturbing factor would crop up to prevent their attainment.

To carry out this series of tests an old single-cylinder vertical engine of 5 in. bore and 6 in. stroke was resurrected and provided with a new cylinder, cylinder head and valve gear. In view of the fact that the use of a stratified charge and a low mean mixture density would, if successful, result in a very low flame temperature, no water jacketing or other means of cooling was provided for the cylinder or cylinder head. The cylinder head was so formed, and the position and timing of the valves were so arranged, that a rich mixture of fuel and air and a large additional supply of pure air entered the combustion chamber at different points, and were so directed that even after their entry, and in spite of very vigorous turbulence, they would not completely mix, the rich fuel mixture remaining always in the neighborhood of the sparking plug, while the air

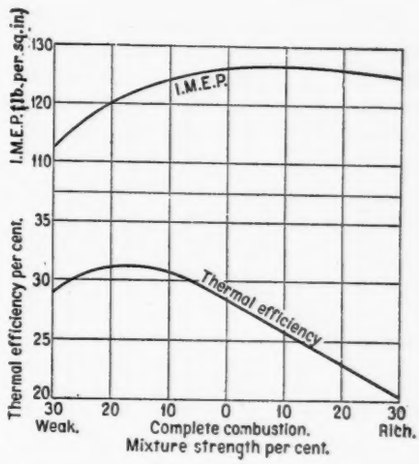


Fig. 6 — Relation between m.e.p. and fuel consumption, homogeneous charge.

remained over the piston.

The power output of the engine was controlled entirely by the quantity of fuel admitted during the suction stroke, no throttle valve or other means of control being provided, so that at all times and under all conditions a full air charge was taken into the cylinder.*

The results proved that the degree of stratification actually obtainable was far greater than expected. It was found possible to reduce the mean mixture strength from a useful minimum of 85 B.t.u. per cu. ft. under ordinary conditions of working, down to as low as 10 B.t.u., and yet obtain perfectly regular running.

A Hopkinson optical indicator was fitted in the combustion head, and the indicator diagram thrown on to a glass screen covered with tracing paper was carefully watched; a number of indicator diagrams were photographed, but for the most part the diagrams were traced in pencil, which was very much quicker; at the same time the brake horsepower of the engine was recorded.

These experiments proved more successful than had been hoped for, and were in very fair agreement with the theoretical figures. The following observations are taken from notes and test reports of 1913-1914:

1. The engine could be started at all times, even on the coldest day in midwinter, on the first pull-over.

2. When running light with an indicated mean pressure of about 14 lb. per sq. in., the exhaust, though perfectly free, was almost inaudible. Also the cylinder barrel remained quite cool, and it was possible to bear the hand on any part of the cylinder head or exhaust pipe even after an hour's running on no load.

*A diagrammatic view showing the principle of operation of the Ricardo localized charge (constant compression) engine was shown on page 1243 of AUTOMOTIVE INDUSTRIES for June 16, 1921.

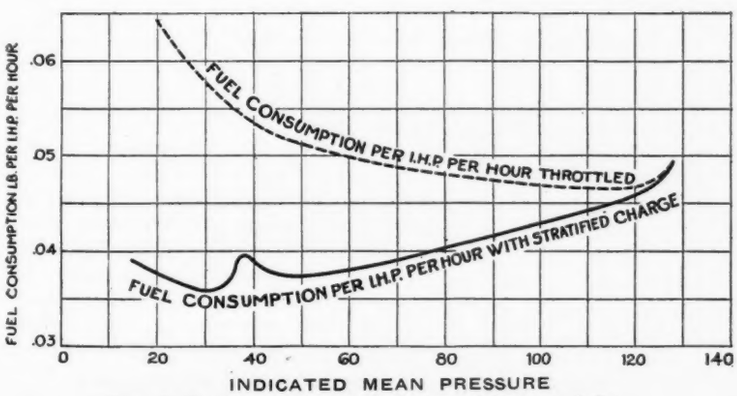

FUEL CONSUMPTION LB. PER I.H.P. PER HOUR
.06
.05
.04
.03
FUEL CONSUMPTION PER I.H.P. PER HOUR THROTTLED
FUEL CONSUMPTION PER I.H.P. PER HOUR WITH STRATIFIED CHARGE
0 20 40 60 80 100 120 140
INDICATED MEAN PRESSURE

Fig. 8—Relation between fuel consumption and indicated mean pressure in engine using stratified charge

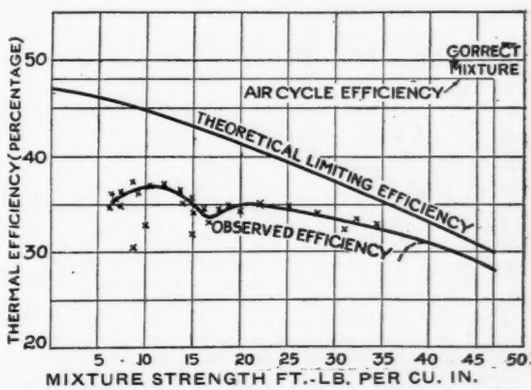


Fig. 9—Relation between thermal efficiency and mixture strength. Observed results are those obtained with engine using stratified charge

3. So long as the admission of fuel was not altered the speed of the engine remained absolutely uniform and the indicator diagrams extraordinarily consistent. Fig. 7 shows an exposure of 20 seconds, taken with the engine running light at about 600 rev. per min., and therefore represents about 100 complete cycles.

4. By opening the needle valve and increasing the admission of fuel the engine would immediately accelerate even from the slowest speed of 120 rev. per min.

5. One very noticeable feature was the extraordinary rapidity of ignition, due to the violent turbulence set up. A fixed ignition timing of 3 deg. before dead center sufficed for all speeds and loads, and invariably gave a perfectly vertical line of pressure rise on the diagrams.

6. Some hundreds of readings of fuel consumption were taken at all loads ranging from dead light to full load, and the mean results of these are shown in Fig. 8, which gives the fuel consumption obtained with indicated mean pressures ranging from 14 to 120 lb. per sq. in. Fig. 9 shows the indicated thermal efficiency actually obtained, plotted against that theoretically obtainable, and presents, on the whole, very tolerable agreement. On the light loads there is undoubtedly some loss due to incomplete combustion.

7. On full load the running of the engine was in every respect normal, but, of course, the absence of any water jacketing prevented the maintenance of full load for more than a few seconds at a time.

8. Perhaps the most noticeable feature of all was the general sweetness and smoothness of running and the extraordinary responsiveness of the engine. Unfortunately, owing to the poor mechanical design of the engine generally, it was not possible to run it at high speeds, the extreme safe limit being only about 800 rev. per min. Tests were made over a speed range of from 150 to 800 rev. per min., and these showed practically no difference in the indicated fuel consumption, the shape or regularity of the indicator diagrams or the general running.

Subsequent experiments carried out on other engines proved, however, that the results obtained on the special experimental model could not be always repeated. Further bitter experience has proved that the author was quite unusually fortunate in selecting proportions in the first instance, and that much further experimental work is required before the system of controlling on the fuel alone can be so boiled down as to be rendered applicable to any type of engine. Quite recently another and much larger engine has been built, operating on the same principle, and employing as far as possible the same form and proportions of combustion chamber. This engine, which has been running at the author's laboratory for the past twelve months, has proved equally efficient, but all attempts to adapt the principle of operating by stratification alone over the whole range of load to existing engines have ended in more or less disappointment.

Experiments With Supercharging Engine

Having established that, under certain conditions at all events, a very substantial degree of stratification could be maintained with, at the same time, sufficient turbulence to insure rapid combustion (although the two conditions may not at first sight appear compatible), and having also proved satisfactorily that under these conditions a very marked reduction in the maximum temperature and a corresponding gain in the efficiency could be obtained, the third series of tests was commenced.

For the purposes of these tests, a special experimental engine was designed using a system of supercharging generally similar to that devised by Sir Dugald Clerk and completed in 1915. This engine, a section of which is shown in Fig. 12, had a bore and stroke of 110 mm. and 140 mm. respectively, and was designed to run at a normal speed of 1500 rev. per min. The upper portion of the cylinder was quite normal and of the L-head type, with the inlet valve placed vertically over the exhaust valve, and operated by a push rod and overhead tappet. The piston, however, was formed in two parts, a plain head of aluminum carrying the piston rings, provided with a very short skirt furnished with a number of small oil grooves and a circular crosshead of considerably smaller diameter, the piston and crosshead being connected together by a hollow aluminum trunk. The crosshead portion of the piston, which carried the wrist pin, reciprocated in a white-metal-lined guide, which was carried in a separate casting interposed between the cylinder and the crankcase.

In its original form the crosshead was of mild steel, and the piston and trunk were of aluminum, the two members being screwed together as shown in Fig. 12. This form of construction, though it cannot be considered mechanically sound, proved very convenient for experimental purposes, since the upper half of the piston could be changed quickly and easily, in order to vary either the compression or the contour of the head, which latter proved to be very important. In point of fact it has never given any trouble in the experimental unit, where great care was taken in the machining of the threads, but the author would never advocate such a construction other than for experimental work. The piston and crosshead, as a whole, were fairly light, the total weight with rings and pin being only 39 oz., which compares quite favorably with that of an aluminum trunk piston of the same size, though aluminum pistons were scarcely known at the time of the experiments.

The cylinder, which was very short, was recessed into the separate casting carrying the crosshead guide, and the extension of the cylinder skirt was provided with a ring of ports uncovered by the piston at the bottom of its stroke; these were surrounded by a movable sleeve or shutter, so that they could be closed off at will. Surrounding the crosshead guide was an annular chamber having a minimum capacity of about 60 cu. in., but the capacity could be varied at will over a wide range by means of hollow detachable plugs. A series of very light phosphor bronze automatic valves admitted air to the chamber and acted as non-return valves during the compression stroke.

Lubrication of the cylinder walls was provided for in the following manner: When the piston had almost reached the top of its stroke a series of small holes drilled through the wall of the crosshead were uncovered above the top of the guide. Owing to the reduced pressure in the crosshead chamber at this point as compared with the pressure in the crankcase, a small quantity of oil-laden air passed out through these holes, with the result that the oil was deposited on the walls of the cylinder, where it was picked up by the short skirt of the piston and distributed evenly over the inner surface.

Operation of Supercharging Engine

In its original form the cycle of operations was as follows:

Commencing at the beginning of the suction stroke, the piston, as it descended, drew from the carbureter a charge of gasoline vapor, and air of normal proportions. Toward the end of the stroke the ports round the lower end of the cylinder were uncovered and a charge of air compressed in the crosshead chamber to a pressure of about 12 lb. per sq. in., entered the cylinder. Almost simultaneously with the opening of the ports the main inlet valve was closed. The supplementary air from the crosshead chamber raised the pressure of the cylinder contents to about 5 lb. per sq. in. above atmospheric pressure, and at the same time formed a layer of air above the piston, which remained in a more or less stratified condition throughout the com-

pression stroke. Fig. 13 represents an ideal indicator diagram, showing the cycle in the cylinder during the suction stroke and the admission of the supercharge air, and Fig. 14 shows an actual indicator diagram taken from this engine. During the upward stroke the contents of the cylinder were compressed, the combustible mixture remaining more or less at the top, and the pure air forming a layer over the piston. Meanwhile, another charge of air was drawn into the crosshead chamber.

At the end of the suction stroke the contents of the cylinder consisted of about 70 per cent of combustible mixture of normal strength, namely, about 95 B.t.u. per cu. ft., and about 30 per cent of air, the former being concentrated more or less in the valve pocket, and in the neighborhood of the sparking plug, and the latter forming a layer over the piston. The mean mixture density of the whole of the cylinder content was therefore only about 66 B.t.u. per cu. ft., a density which, under ordinary circumstances, would not have been inflammable. On ignition, the combustible mixture in the neighborhood of the sparking plug ignited with great rapidity, causing further violent turbulence in the combustion chamber, so that the air and the burning mixture were intimately mixed, but not until combustion was well under way.

Scavenging by the Use of Supercharger

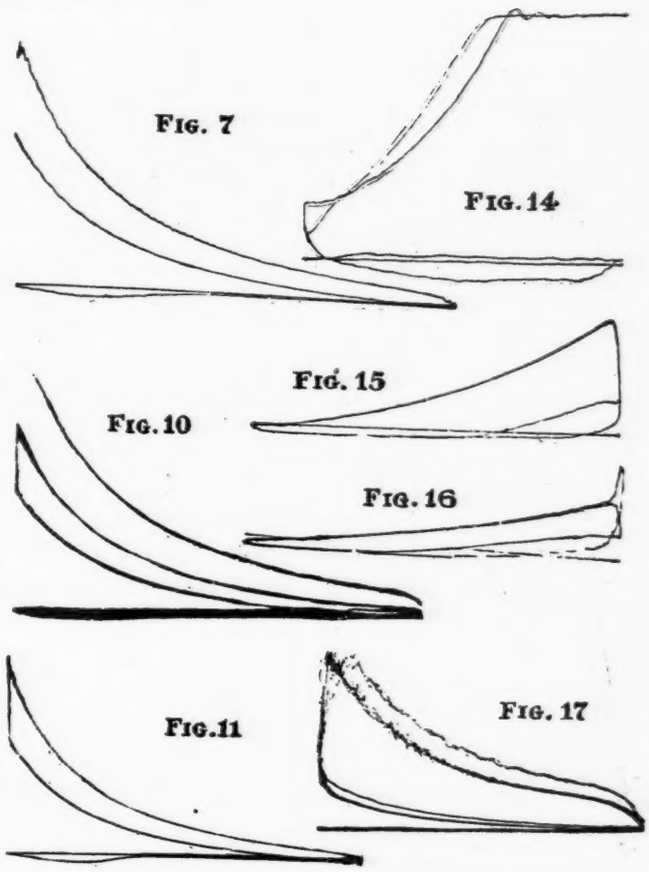
Toward the end of the expansion stroke, the exhaust valve was opened in the usual manner and, shortly afterward, the ports in the cylinder walls were again uncovered, and the cylinder swept through and partially scavenged by the second charge of air compressed in the crosshead chamber; this second charge again entered above the piston in a more or less stratified form, the gas immediately above the piston being mostly air, while that nearer the top of the cylinder consisted mainly of exhaust products. On the upward stroke of the piston, the residual exhaust gases and part of the air were expelled through the exhaust valve, leaving the clearance space partially full of air. There was thus provided alternately a supercharge of air at the end of each suction stroke, and a scavenging charge at the end of each firing stroke, so that not only did the cylinder receive an additional charge of air over and above the charge drawn in from the carbureter, but a further supply of air was provided by the scavenging charge, which had the effect of replacing the residual exhaust gases in the combustion chamber with, at all events, a considerable proportion of pure air.

It will be seen, therefore, that, on paper at all events, the temperature of the cycle was reduced in two directions:

1. By lowering the flame temperature;
2. By scavenging during the exhaust stroke, while the air content was increased approximately 40 per cent, about 33 per cent by the supercharge and possibly 7 per cent by the scavenging.

It is obvious that the engine could be operated on either of two systems. Either a very rich charge could be admitted through the carbureter, providing sufficient fuel to combine with the whole of the air, in which case the mean pressure would be increased by 40 per cent, while the temperature of the cycle would still remain less than normal, thanks to the cooling effect of the scavenging charge; or a normal mixture could be admitted through the carbureter, in which case the air acted merely as a diluent, lowering the flame temperature and so increasing the efficiency of the cycle.

Before attempting any actual tests the engine, which was direct coupled to an extremely sensitive swinging-field electric dynamometer, was driven at its normal speed of 1500 r. p. m., and indicator diagrams were taken both from the crosshead chamber and the cylinder, the indicator being operated by linkage direct from the crosshead, in order to avoid any possible errors in synchronism.



ACTUAL INCICATOR DIAGRAMS TAKEN UNDER VARIOUS CONDITIONS.

Figs. 7, 10 and 11 with stratified charge. Fig. 14 showing admission of supercharge. Fig. 15, diagram from crosshead chamber engine driven by dynamometer. Fig. 16, diagram from crosshead chamber when running under own power. Fig. 17, diagram from working cylinder under normal running and when undercharging

Timing Admission of Supercharge

Fig. 15 shows the indicator diagrams obtained from the crosshead chamber after timing of the valves had been adjusted to give what appeared from the indicator diagrams to be the best possible results. In its original form the ports opened and closed 28 deg. before and after the bottom dead-center, and the inlet valve closed 10 deg. before the bottom dead-center; the motoring experiments, however, showed that it was unnecessary to close the inlet valve until after the bottom center was reached, since owing to the time lag there was found to be no tendency to blow back into the carbureter at speeds above 1000 r.p.m.

A very careful analysis was made both of the frictional losses and of the power absorbed in pumping both in the cylinder and crosshead chamber. These were found to be as follows, expressed in terms of mean pressure:

Total frictional losses, including windage losses	11.5 lb. per sq. in.
Fluid pumping losses in cylinder	3.5 lb. per sq. in.
Fluid pumping losses in crosshead chamber	4.5 lb. per sq. in.
Total friction and fluid pumping losses	
When running normally	15.0 lb. per sq. in.
When supercharging	19.5 lb. per sq. in.

Having arrived at what appeared to be the best possible timing from the point of view of volumetric efficiency, the actual tests were started toward the end of 1915. A Claudel carbureter was used, fitted with a needle valve in the jet, in order to adjust the mixture strength. The

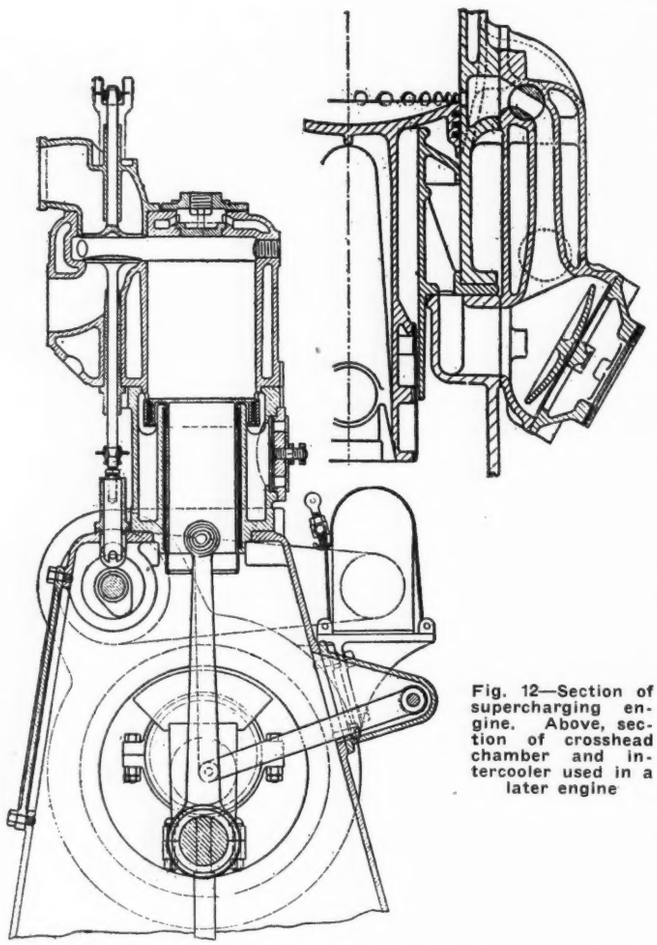


Fig. 12—Section of supercharging engine. Above, section of crosshead chamber and intercooler used in a later engine

first results proved in some respects rather disappointing.

The main object aimed at, namely, the ability to work with a low mean mixture density, proved successful from the start, and it was found that the engine would run perfectly steadily with full supercharge when the charge admitted through the carbureter was rather on the weak side for normal running without supercharge. In spite of the extra work done in pumping on the underside of the piston, both the brake horsepower and consumption were improved by about 5 per cent when supercharging, the gain in indicated efficiency being nearly 10 per cent, which was in very close agreement with the theoretical gain. So long as the supercharge air was used only as a diluent and no attempt was made to increase the mean pressure beyond the increase due to the improved efficiency, all went well, but so soon as an attempt was made to raise the mean pressure to any substantial extent by enriching the mixture admitted through the carbureter, troubles began.

Although the flame temperature was lowered very considerably, as was proved by the gain in efficiency, the average temperature of the cycle was not apparently reduced to the extent that had been anticipated. When running normally with the most economical mixture the brake mean pressure obtained was 106 lb. per sq. in., corresponding to an indicated mean pressure of 121 lb. per sq. in. When supercharging with the same mixture strength the brake mean pressure rose to 112 lb. per sq. in. and the indicated mean pressure to 131.5 lb. per sq. in. When, however, any attempt was made to increase the mean pressure by enriching the mixture, severe detonation was set up which soon resulted in preignition.

At this time very little was known about the phenomenon of detonation, which was supposed to be merely a premonitory symptom of pre-ignition and not, as is now realized, a perfectly distinct phenomenon, and often the cause but not the symptom of pre-ignition. At that period, however, the author, in common with most others, supposed that detonation and pre-ignition were kindred phenomena and that they were dependent solely upon the temperature of compression. This theory, however, did not appear at all satisfactory, for it was clear that the compression temperature must depend upon the ratio of compression and the initial temperature of the gases in the cylinder; since, however, the compression ratio in the cylinder was the same whether running normally or supercharging, and since the temperature of the supercharge was not high, while the effect of the scavenging was to replace the highly heated products of combustion remaining in the cylinder at the commencement of the suction with a certain proportion of comparatively cool air, it was difficult to believe that the compression temperature could be higher when supercharging than when running normally.

Lastly, the possibility that any uncooled part within the cylinder, such as the sparking plug points or the exhaust valve head, were reaching a higher temperature when supercharging was disposed of. A water cooled sparking plug was made up, and observation through the exhaust port showed that the exhaust valve, which was at a bright red heat when running normally, fell to a dull red when supercharging. Finally a stream of cold water was directed continuously against the underside of the exhaust valve head. Neither of these expedients proved of much avail. Although the author's belief that detonation and pre-ignition were closely allied and dependent upon temperature had by this time received a considerable shaking, he nevertheless decided to make every possible endeavor to reduce the compression temperature.

The direct passage of air from the crosshead chamber to the cylinder was cut off by a diaphragm, and the air was forced to travel through an intercooler consisting of a nest of small tubes cooled with a liberal supply of cold water, in order to insure that most of the heat of compression in the crosshead chamber and any conducted heat from the piston was removed before the supercharge entered the cylinder. This intercooler, which was destined to play an important and valuable part in the later experiments, had at this stage no effect whatever. Next, in order to increase the effect of the scavenging charge, the exhaust valve was set to open some 66 deg. early, or 10 deg. earlier than before, when, contrary to the author's expectation, the detonation and pre-ignition became far worse, so much so in fact that the engine would not run for any length of time on the supercharge at all, even with the weakest mixtures. This was somewhat of a surprise, and pointed to a new line of investigation altogether. The indicator was next fitted on the intercooler and diagrams were observed while running. It was found that when the exhaust valve opened 56 deg. early, the exhaust pressure in the cylinder at the moment when the ports were opened was sligthly in excess of that in the intercooler, with the result that a very small quantity of exhaust gas passed out of the cylinder into the cooler and then back into the cylinder, followed by the air scavenge charge. When, however, the exhaust valve was set to open earlier this did not occur.

As a result of this experiment, the author came to the conclusion that the pure air scavenging charge, instead of flushing out and cooling the cylinder, tended to combine with the products of combustion, some of which were then not completely burned down to CO_2, and so assisted in the continuance of combustion during the exhaust stroke. Now the effect of passing some of the products of combustion out of the cylinder, cooling them below the ignition tem-

perature and then re-admitting them, was to prevent or, at all events, greatly reduce the after-burning, and also absorb the heat liberated by reassociation.

The next experiment tried was to open the exhaust valve 52 deg. early, with which setting the pressure in the cylinder was approximately 36 lb. per sq. in. when the ports were opened, with the result that a very substantial proportion of exhaust products passed through the intercooler.

Fig. 16 shows an indicator diagram taken from the intercooler under these conditions. With this setting it was found possible to increase the mean pressure to about 128 lb. per sq. in. on the brake, or 147.5 lb. per sq. in. indicated without detonation. This result appeared to clearly indicate that the lowering of the temperature brought about by eliminating the after-burning during the exhaust stroke had reduced the tendency to detonation and pre-ignition. A number of measurements were made of the heat carried away by the cooling water, both when running normally and when supercharging, and it was found that the proportion of heat carried away was about 6 per cent less when supercharging.

During the same period, namely, the latter part of 1915, the author was carrying out another series of tests on the use of kerosene, and great difficulty was experienced with detonation. The experiment was then tried of admitting along with the kerosene, vapor and air a small proportion of cooled exhaust gases, as is done in the case of coke oven gas-engines; this proved so completely successful in eliminating detonation, and with it all tendency to pre-ignition, that the experiment was tried of admitting a small proportion of cooled exhaust gas into the cylinder of the supercharging engine along with the fuel and air through the main inlet valve. This had the immediate effect of entirely eliminating all tendency to detonate, and it was found possible, by merely enriching the mixture, to raise the brake mean pressure to 140 lb. per sq. in. and the indicated to 159.5 lb. per sq. in., which was the highest limit attainable, the whole of the supercharge air being then required for complete combustion of the fuel. The quantity of exhaust gas admitted in this manner was extremely small, and yet its influence was remarkable.

Effect of Exhaust Valve Timing

The effect of this experiment was to raise doubts in the author's mind as to whether the after-burning during the exhaust stroke had really been the cause of the troublesome detonation. The exhaust cam was therefore set back to open the valve 66 deg. early, and a further test was made with cooled exhaust gas admitted through the carbureter, when it was found that the mean pressure could still be raised until the whole of the supercharge was saturated without being troubled with detonation, though a somewhat greater quantity of exhaust gas was required under these conditions. This proved that the general rise of temperature due to after-burning was not largely responsible for the detonation, and it seemed probable that the most significant effect of opening the exhaust valve late was that a proportion of the exhaust gases passing through the intercooler did not re-enter the cylinder during the scavenging period, but remained in the crosshead chamber, and were re-admitted along with the supercharge. As it might be rather inconvenient to admit exhaust gas through the carbureter in the case of a multi-cylinder aero engine, the possibility of admitting it along with the supercharge, and at the same time scavenging with cooled exhaust gas, was far more attractive. Accordingly, the exhaust valve was set to open 48 deg. early, so that the pressure in the cylinder was still about 50 lb. per sq. in. when the ports were uncovered, and probably nearly one-third of the total exhaust products passed through the intercooler, for the maximum pressure in the crosshead chamber rose momentarily from 12 to 28 lb. per sq. in. Under these circumstances the scavenging charge consisted mostly of cooled exhaust gas with a relatively small proportion of air, while the supercharge consisted mainly of air, but with a small proportion of cooled exhaust gas.

With this setting the engine behaved satisfactorily in every respect, and both objects were attained, for on the one hand the engine could be run on a low temperature cycle, using the supercharge as a diluent, and so attain a very high thermal efficiency, and, on the other hand, the supercharge could, when desired, be used as an addition to the active working fluid, and a very high power output could be obtained, while of course any compromise was available between these two limits.

In Fig. 17 is shown a typical indicator diagram taken with the engine running normally and when supercharging —the fuel consumption and speed being the same in both cases.

The Effect of Certain Refinements

Having achieved the main objects the next step was to pay attention to refinements, and a number of minor improvements were made.

1. It was found, as might be expected, that the relatively early closing of the inlet valve caused some loss of volumetric efficiency, though this was compensated for to some extent, for when supercharging, the lower the pressure in the cylinder the greater the pressure-difference between that and the crosshead chamber, and therefore the greater the proportion of supercharge which entered. The inlet valve was already very large and the acceleration of the valve gear was very nearly up to the limit, so that little could be done in that direction; but the expedient of recessing the seating of the inlet valve, so that it formed a mask was adopted. The valve then acted as a piston valve, giving a very quick cut off when entering the recess or mask, after which it could be closed on to its seating at leisure; since the pressure-difference on either side of the valve was relatively small during the period of entry of the supercharge and the early part of the compression stroke, the leakage between the valve and the mask was very slight. This simple expedient proved successful, and has been used in all the tank engines and other engines the author has since designed, whether supercharged or not. The effect in the case of the engine in question was to increase the brake mean pressure when running normally from 106 to 109 lb. per sq. in. at 1500 revs. per minute, and when supercharging from 146 to 147.5 lb. per sq. in.

2. The intercooler, which originally consisted of a nest of very small tubes, was changed to a single flattened tube. The small tubes with their many soldered joints were a source of weakness, and since the function of the cooler had changed from that of cooling an already fairly cool air supercharge to that of cooling a relatively small quantity of very hot exhaust gas, it was obvious that a greatly reduced cooling surface would suffice.

3. It was found that the degree of stratification could be further extended and the economy and economical range of the engine could be increased by checking the rate of entry of the supercharge into the cylinder, and also by making the top of the piston concave, which further encouraged the supercharge air to form a layer over the piston. In order to check the rate of entry a baffle was provided in crosshead chamber near entry to intercooler.

4. The effect of cooled exhaust gases in checking detonation was so impressive that it was decided to raise the compression ratio from 4.7 to 5.1:1. Still higher compression ratios up to 6:1 were tried and, although the economy was improved in proportion to the compression, it was then found necessary to add so much inert gas to

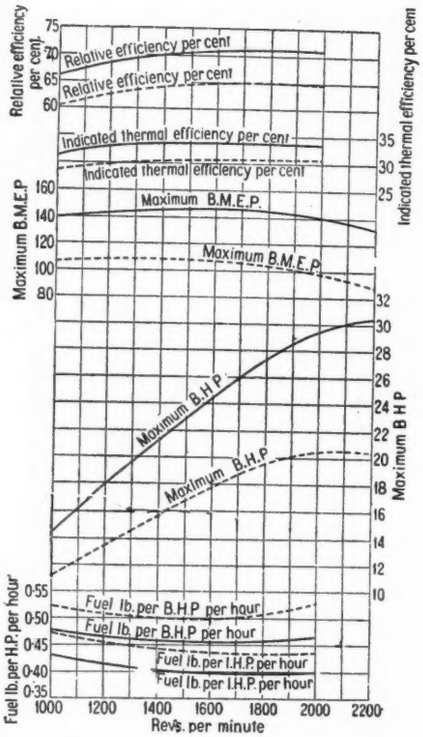

Relative efficiency per cent.
Relative efficiency per cent
Relative efficiency per cent
Indicated thermal efficiency per cent
Indicated thermal efficiency per cent
Indicated thermal efficiency per cent
Maximum B.M.E.P.
Maximum B.M.E.P.
Maximum B.M.E.P.
Maximum B.H.P.
Maximum B.H.P.
Maximum B.H.P.
Fuel lb. per B.H.P. per hour
Fuel lb. per B.H.P. per hour
Fuel lb. per I.H.P. per hour
Fuel lb. per I.H.P. per hour
Fuel lb. per H.P. per hour
Revs. per minute

Fig. 18 — Performance curves of supercharging engine. Full lines with supercharger in operation. Dotted lines supercharger not in operation.

the supercharge that the maximum power output was decreased.

With these modifications, the experiments so far as this engine was concerned were completed. The results obtained may be summarized as follows:

NORMAL RUNNING

Experimental supercharging engine: 110 mm. bore × 150 mm. stroke (4.33 × 5.92 in.). Compression ratio 5.0 : 1.

Revs. per Min.	Max. B.h.p.	Max. B.M.E.P.	B.M.E.P. at Most Economical Load	Fuel, Lb. per B.h.p. per Hr.	Fuel, Lb. per I.h.p. per Hr.	Ind. Thermal Efficiency Per Cent	Relative Efficiency Per Cent
1000	11.2	106	103–105	0.525	0.475	28.6	60.3
1200	13.5	108	104–106	0.510	0.455	29.9	63.0
1400	15.9	109	105–107	0.501	0.443	30.7	64.6
1600	17.9	108	104–106	0.502	0.44	30.9	65.0
1800	19.7	105	101–103	0.515	0.438	31.0	65.3
2000	20.6	99	95– 97	0.535	0.440	30.9	65.0
2200	20.5	90	.....	....	....	...	...

SUPERCHARGING

Revs. per Min.	Max. B.h.p.	Max. B.M.E.P.	B.M.E.P. at Most Economical Load	Fuel, Lb. per B.h.p. per Hr.	Fuel, Lb. per I.h.p. per Hr.	Ind. Thermal Efficiency Per Cent	Relative Efficiency Per Cent
1000	14.7	140	110–135	0.483	0.434	31.4	66.2
1200	18.0	143	112–137	0.465	0.416	32.7	68.8
1400	21.2	146	115–140	0.461	0.408	33.4	70.3
1600	24.6	148	115–142	0.459	0.402	33.8	71.3
1800	27.5	146	115–140	0.461	0.400	34.0	71.6
2000	29.6	141	112–136	0.470	0.405	33.7	71.0
2200	30.5	133	.....	....	....	...	...

It may be argued that the normal power and efficiency of the engine were, compared with present-day practice, rather poor, but it must be remembered that the engine was designed nearly seven years ago, and also that the combustion head with valves in a side pocket was not of the form to give either the best power or economy.

It is obvious, however, that the percentage of improvement over normal running, both as regards power and economy, by the employment of a stratified supercharge will hold good whatever the normal performance may be.

The main object of all these experiments has been the application of the system to aircraft, the principal advantages being:

1. A very much greater increase of power in proportion to the increase of weight, the increase of weight being approximately 10 per cent, while the increase of power with fully saturated supercharge was nearly 40 per cent.

2. The method provides automatically a means of compensation for altitude. If on the ground the carbureter is set to give a normal weak mixture, then the whole of the supercharge air is acting merely as a diluent, giving improved economy and a slight increase in power. As the machine rises the flow of gasoline through the jet decreases as the square root of the density, while the weight of air decreases directly as the density; hence the mixture supplied by the carbureter gradually becomes richer and more and more of the supercharge is used as active working fluid, until at about 15,000 ft. the whole of the supercharge air is saturated. From ground level, therefore, to 15,000 ft. the power of the engine will decrease only as the square root of the density instead of directly as the density, as in the case of a normal engine, while throughout the whole of this range there will always be an excess of air present in the cylinder sufficient to ensure complete combustion, and the maintenance of conditions ensuring maximum economy.

3. In a multiple cylinder engine any lack of uniformity in distribution is corrected, since if any one cylinder receives a richer mixture than the others, instead of the fuel being wasted, more of the supercharge air in that cylinder is carbureted and the power output increased.

All the experiments referred to above were carried out during the years 1915 and 1916. During 1916, when the results had reached a reasonably satisfactory stage, an order was placed to build a twelve-cylinder supercharging engine of 600 b.hp. At that date this was, to say the least of it, an extremely ambitious undertaking, but such an engine was actually built, though progress was necessarily very slow, and all official interest in the engine was lost and the engine had become thoroughly out of date long before its completion. On test, this engine actually developed over 700 b.hp., but the main crankcase casting proved defective and developed serious cracks.

It will be apparent from the above description of the experiments that although the system of supercharging with a stratified charge can be made to give the performance that might be expected from purely theoretical consideration, yet it is rather sensitive. Much for instance depends upon the opening diagram of the exhaust valve and the closing diagram of the inlet valve, on the capacity of the intercooler and crosshead chamber, and on the position and area of the baffle, etc.

Throughout 1917 and 1918 the engine was entirely monopolized for carrying out tests relating to the tank engines, and since the armistice it has been devoted to carrying out tests on fuels, for which purpose the use of supercharging proved invaluable. A great deal of information has been obtained during the four years which have elapsed since the experiments were broken off, and many of the problems which puzzled the author at that time have now been cleared up. With the knowledge now available as to the phenomena of detonation, as to the important influence of combustion chamber design, and as to the treatment and influence of different fuels, very great improvements could undoubtedly be made. It is hoped shortly to build a larger and more up-to-date experimental engine on generally similar lines but embodying all the most recent information.

SWITZERLAND imported the following quantities of automobiles in metric tons during the years mentioned: 1913, 1059 metric tons; 1919, 5606 metric tons; 1920, 11,747 metric tons. The imports of automobiles into Switzerland during the same years were as follows: 1913, 2171 metric tons; 1919, 2668 metric tons; 1920, 1801 metric tons. It will be noted that not only are the Swiss exports of automobiles much smaller than the exports, but the exports have actually declined since 1913.

Economy and Efficiency Increased by New Final Assembly System

Many assembly difficulties were surmounted in installing the new final assembly system described here. The equipment had to be adapted to buildings already in use. High efficiency has been attained despite the necessity of turning corners. Methods of equipment are discussed.

By Norman G. Shidle

SOMETIMES a production layout can be designed before any structures have been built in which to house it. In such cases the buildings can be erected to conform with the most efficient production system as determined from a study of the theoretical possibilities. This situation is not common, however, in actual manufacturing. More often the production engineer is compelled to adapt his system and methods to a building or set of buildings already erected and perhaps previously used for some other purpose.

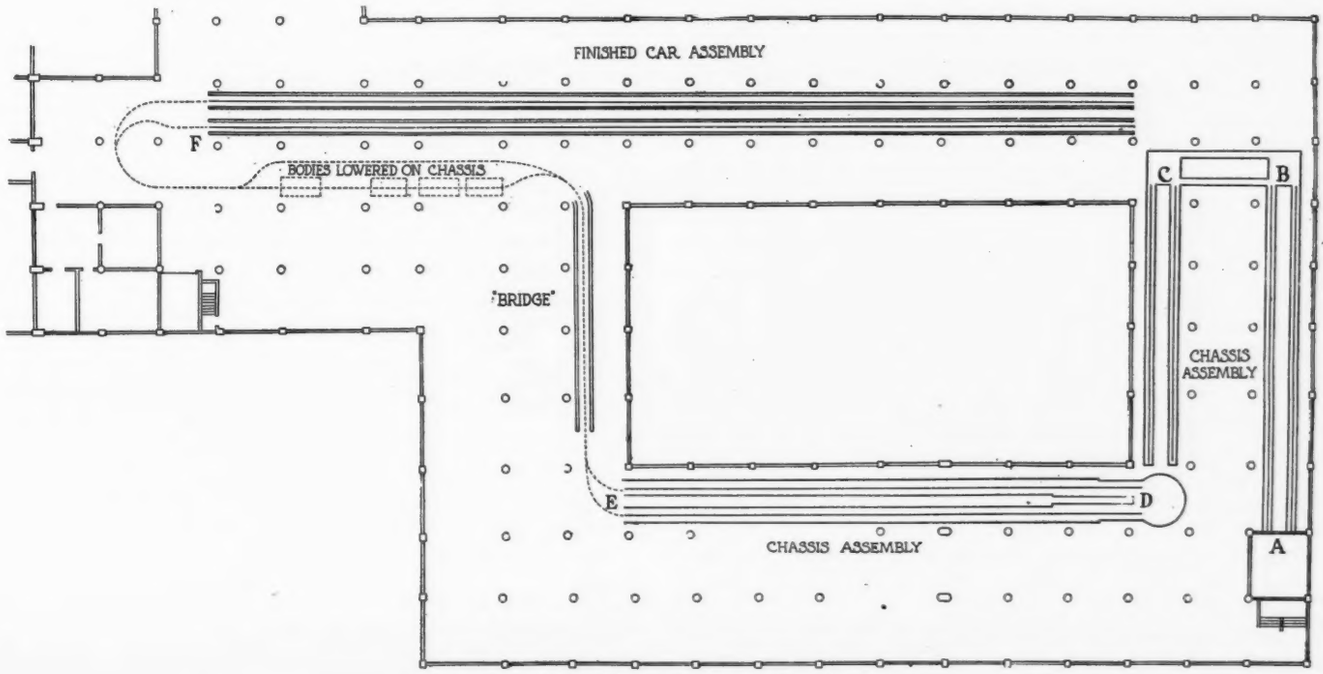
Because this latter case is the more usual, a plant in which the adaptation has recently been made with special success furnishes an interesting example for study. Although compelled by the construction of the buildings to take a number of turns, an efficient final assembly system has been put in operation at the Franklin Automobile Company and has already proved its economy in the few months since its installation.

This final assembly system is divided into two parts, namely, the chassis assembly and the finished car lines. The mechanical conveyor equipment for each line is different, the chassis conveyor being a single chain, and the final car assembly conveyor being a two-belt conveyor operating over rollers. The chassis rests on trucks while on the chassis assembly line, the truck hooking on to the conveyor. When the chassis reaches the finished car line, however, the wheels rest on two moving belts.

A feature of the Franklin practice of special interest at present is the effective utilization of excess equipment with the consequent reduction in unit costs. The conveyor equipment on these final assembly lines is capable of handling over 100 cars a day, while production at present is being held at forty a day. There are two conveyor lines for the chassis assembly and two for the final car assembly, but only one of each is in active use.

The excess equipment, however, is being efficiently used, as will be brought out in the following detailed description. This point is emphasized, however, because it is of great importance just now in many plants. The methods used here may furnish ideas for similar methods elsewhere, whether in connection with assembly or other production work.

The chassis assembly line begins at point A indicated on the floor plan shown in Fig. 1. The front and rear axle and spring assembly is brought to the assembly line in completed form. A few minor operations are completed



Floor plan of chassis and final car assembly layout.

before the frame is placed on the conveyor. These include such operations as assembling bearings to shaft, shaping brake bands, filling and assembling grease cups, assembly ball and spring box steering gear connection, assembling end of emergency brake rods, etc.

Two specially constructed trucks carry each chassis as it moves along the conveyor. These trucks are so constructed as to hold the chassis some four feet off the ground during the first few operations and then to allow the lowering of the chassis to a height of about two feet for the remaining operations. Detailed drawings of one of these trucks are shown in Fig. 2.

The first man performs several operations after the frame has started to move on the chassis conveyor. He assembles the hood holder hinge, bolts for running board, battery box, front and rear bolster bolts, elevator bolts for muffler. Then by means of a power hoist he turns the sill over and it goes on to the next set of operations. Fig. 3 shows the beginning of the chassis assembly line.

While in inverse position, the following units are assembled to the sill: running board bolts, muffler, muffler tail pipe, trunnion support brackets, foot lever springs. The gas tank bracket holes are reamed at this point. The sill is then returned to its upright position.

Two men work together on the next set of assembly operations. They put into place the emergency brake lever, the gas line, horn bracket, battery box supports, emergency brake rod, and the running board.

After the sill blocks have been assembled, the rear axle is put into place and the cardinal shaft is lined up. The sill is returned to its upright position after the rear axle has been assembled.

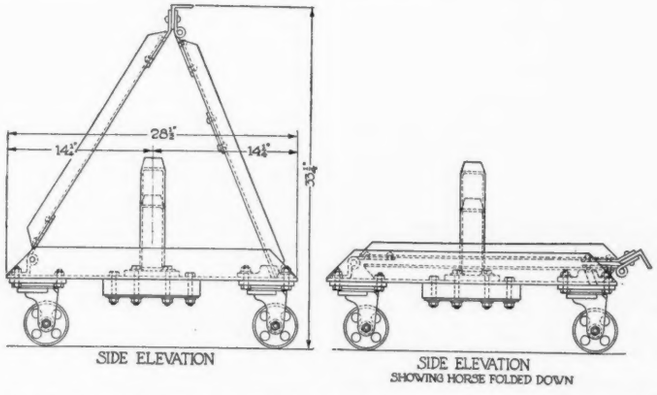


Fig. 2—Special trucks on which chassis is carried over conveyor line

This completes the first stage of the journey. The chassis has then reached the point marked "B" on the floor plan. The trucks are loosed from the conveyor chain and following grooves in the concrete floor, which serve as tracks, is pushed across to the second part of the chassis assembly conveyor line. During its trip across, as shown in Fig. 4, the front and rear wheels are assembled together with the battery box cover, the gas tank, and gas tank filler. The trucks are then caught on the next conveyor line, which begins at the point marked "C."

An adjustment operation is the first one on this line. Two men line up and adjust the emergency brake bands and assemble the gas tank filler. The engine is then put into place. In bringing the engine to this point in the assembly line, a part of the excess equipment, previously referred to, is being utilized. The engines come from the sub-assembly to the far end of the final car assembly line near the point marked "F" on the ground plan.

Since only one of the conveyor lines is being used at present, the engines are transported the length of the building on the second final car conveyor. Thus they are brought to the point "C" on the chassis assembly line at which they are put into place. When both final car conveyors are in use, a separate conveyor will be used for carrying the motors to the place of assembly. Fig. 5 shows the motors on one conveyor and the final car assembly on the other.

After the motor has been aligned and bolted down, the trunnion support rod is assembled, the spark plugs are set and the H. T. wire conduit put in place. The chassis then passes to the next workers, who line up and bolt down the transmission. They also assemble the foot levers to the transmission rail, put on the steering device and tighten the spark-plugs.

A group of three men performs the next operation, which consists of assembling the front drive shaft flange, placing ball on change gear lever handle, tightening valve caps, assembling battery box holder bolts, fastening spring to foot lever, and assembling engine boots to engine base. In the next operation the starter cable is assembled and the lower flywheel guard adjusted.

The next operation brings the chassis to the end of the second leg of its trip. Here three men perform a number of minor adjustment operations, such as reaming holes and shaping lower flywheel guard, lining up the wheels, assembling diagonal rod to steering device, etc. These operations are preparatory to the first engineering inspection. This inspection is very minute and every detail of assembly and adjustment is carefully checked up. All defects and troubles are listed and the list is passed on with the chassis to the next man, whose task it is to make the necessary repairs and readjustments before the chassis proceeds farther.

When these repairs have been finished the car is ready for the third stage of its journey. As it comes off this conveyor the trucks are removed, and the chassis is run on to a round table, as shown in Fig. 6. This round table swings the chassis around the corner and in position to catch on the third leg of the conveyor system at the point marked "D."

Here the upper flywheel guard and the diaphragm are assembled, the gas line is straightened, the carbureter throttle lever put in place, and the junction box is assembled to the sill. The next operation is performed by a group of three men and consists of assembling the front engine jacket, oiling all running parts, assembling pivot bolt cups, knuckle bolt, muffler exhaust pipes and muffler exhaust pipe bracket. Then the drain cock handles are assembled complete, the muffler exhaust stumping box is tightened, the heater pipes are assembled, and the linoleum is fitted and tacked to the chassis.

A second engineering inspection, followed by the necessary repairs and readjustments, then takes place. This is followed by a final engineering inspection with other repairs and readjustments.

Necessary painting is then done of the top of the chassis, the hub caps are put on, the front guards are assembled to the running board and a few minor drilling operations are performed. The chassis is run off the conveyor line at the point marked "E" and on to "bridge," which permits the accomplishment of necessary work underneath the car. This "bridge," shown in Fig. 7, is equipped with a power conveyor which carries the chassis from the floor level. While on the bridge the front guards are assembled to the sill, the seat pedals are finally assembled, and the necessary painting underneath the car is done. The running board shields are assembled and the completed chassis is run off the bridge and into position for receiving the body as indicated by the lines on the floor plan.

This completes the twenty-one operations on the chassis assembly line. Forty-five men are required for the regular work on this line, while four utility men are employed for

Fig. 3 (Top)—Beginning of chassis assembly line

Fig. 4 (Top)—First turn in assembly line; wheels assembled at this point

Fig. 5 (Center)—Showing utilization of second final car assembly conveyor for transporting engines to assembly point

Fig. 6 (Center)—The round table at the second turn in the assembly line

Fig. 7 (Bottom)—Chassis pulled on to "bridge" by power conveyor

Fig. 8 (Bottom)—Beginning of final car assembly line

general work and for filling in gaps. There is also one working master workman, bringing the total men on the chassis line to fifty. The conveyor on the chassis line moves at the rate of 1 2/3 ft. per minute. This produces the quota of forty a day in 8.7 hours.

The body is lowered on the chassis by means of an overhead crane. The horn wires are assembled to the decks, the horn and headlight wires are attached to the sill, the wires are packed under the cowl and the upper carbureter heater wire is connected. The body is then assembled to the chassis. The chassis with the body attached is then run on to the final car assembly conveyor, Fig. 8.

There are other detailed operations in connection with the body work, but since a change in methods is contemplated in the near future, these details need not be discussed. Twenty-eight men are used in the body assembly work. A plan is now under way to utilize the extra chassis conveyor for the body assembly work. This would put the body assembly on a progressive assembly basis and make for greater efficiency, while there would be no added equipment cost since only equipment now idle would be utilized in making the improvement.

The chassis and body now start down the final leg of the assembly run, beginning at the point marked "F" on the plan. The next operation is that of assembling the rear guards and sill finishing strips and fastening the running board shields to the body. From this point to the end of the final car line there are twelve more operations to be performed. The first of these consists in nailing back curtains to the body, assembling the back curtain complete and assembling the headlight brackets.

This is followed by the toe and floorboard assembly. Next the rear rocker carpets, upholstering, seats, bags, etc., are put in place and the mud apron and headlights are attached. The steering device clamp is next attached, followed by the front and rear mats, the foot lever pads, the dash air control, and the needle valve. This operation is completed by the assembly of the oil can holder, the connecting of the speedometer cable and transmission and the placing of the bell crank.

The next operation includes the assembly of the vacuum tank hush pipe, suction yoke heater, and dash control. The wiring is completely assembled after this and the necessary painting is done. Next the hood is roughly fitted to the dash and the hood V blocks and hood locks are located and assembled. The assembly of hood hinge pins and engine jacket filler constitute the next operation, while the last operation before the engineering inspection consists in finish fitting the hood complete. The usual repairs and adjustments then follow the engineering inspection. The car is then given a final engineering inspection and is practically at the end of its trip. Final repairs and adjustments remain to be made, while a few minor assembly operations, such as assembling brackets on hoods, etc., complete the assembly process.

There are sixteen operations performed on the final car assembly line, forty-four men being used on this job.

This description completes the mechanical phases of this newly installed assembly conveyor system. The results attained have been excellent and are dependent partly upon this mechanical equipment and partly upon the human phases of the production methods in use at this plant.

Since the introduction of this conveyor system a few months ago there has been a decided increase in the production per man. Grouping together the chassis and the final car assembly system, some thirty less men are being used then heretofore to produce the forty car a day quota. For the chassis, body, and final car assembly there are now 131 men used.

There are other factors besides that of the regularity of effort enforced by a moving conveyor, however, which operate to increase production per man. One of these factors is the goodwill which the management has engendered among the workers.

Because of the unemployment situation there has been an increased individual efficiency noted in practically every plant. This has been the case at Franklin as well as elsewhere. Not only has actual working efficiency increased, but regularity of attendance has become much more common. Every man is there every day, ready to work all day unless something very serious keeps him away. It is not necessary to carry as many extra men to insure a given production.

An unusual feature of the results at this plant is that production per man was increased when the men were taken off piece work and put on a day work basis. The moving conveyor, of course, maintains a scheduled output, but the experience of increasing production when changing to a day rate basis is not common. It is true, however, that wages have not been cut at this plant since the industrial depression set in and the men on these assembly lines are earning as high wages as at any previous time. Thus far wages have been maintained through an increase in individual efficiency and closer study of detailed production factors.

Another factor which should be mentioned is that the men are encouraged to make suggestions for improvements in production methods. Prizes are offered for adopted suggestions and the pictures of those presenting such suggestions are given prominence in the company house organ. There have been several such suggestions adopted in connection with these assembly lines. While the suggestions related to minor phases of production, they each made for greater efficiency. In addition to the actual value of the suggestions, moreover, must be considered the potential value of the increased interest in the work thus aroused among all the workmen on the line.

It is through the effective correlation of the mechanical and human phases of production activity that the excellent results have been recorded at this plant. It is an achievement for an automobile plant to be producing at this time two-thirds of the highest production ever recorded for the factory. The frankness of the management with the men, the real facts and information presented to the men in the company house organ, and the honest attempt to give the workmen a fair deal in every way has undoubtedly played an important part in making possible that achievement. All increases in production efficiency are not made in the office of the production manager.

VARIOUS large bodies interested in the use of automobiles and motor trucks in Germany recently had a meeting to organize with a view of combating a proposed heavy increase in the tax on automobiles. The organizations represented were the Automobile Club of Germany, the General German Automobile Club, the German Brewers' Union, the Association of Automobile-Using Physicians, the Association of Automobile Dealers, the Association of Carriage and Automobile Body Builders and the Association of German Motor Car Manufacturers. Recently automobile and motor truck owners have not only been compelled to pay heavy annual registration fees, but in many instances counties and even communes have levied taxes on cars and trucks. Against this practice it is urged that if it were not for the use of the motor truck many industries would show less profits or no profits at all and hence would not be able to bear such heavy tax burdens. It is not planned to oppose any increase in automobile taxation, but merely to work against the imposition of prohibitive taxes which would prevent the creation of new wealth through transportation.

Progressive Production Methods Applied to Body Building

The application of quantity production methods to body building is limited by the dependence of the body builders on car production conditions. A high degree of efficiency is possible, however, as is evidenced by the system described. Kiln drying lumber is an important phase.

By George J. Mercer

WHEN a body building plant grows to a large size it shares with other industries the necessity for quantity production methods, together with the maintenance of high quality of product. Under such circumstances it is often advisable for the body manufacturer to control rather directly a large part of his sources of material supply.

Certain features of body building practice, however, place a definite limit on the extent to which quantity production methods and automatic machinery can replace human skill and effort. A great deal of hand work is necessary in the actual production of bodies. Then, too, body production must always depend for its rate of production upon the status of car production. The body plant cannot go forward with production until the car factory is in operation. Moreover, the body plant usually must be equipped to handle a variety of designs and materials and to provide bodies for different kinds of chassis. Consequently, it is often necessary to change the set-up of tools and equipment from season to season.

While the dies and jigs in the shop must be changed for each design, a large part of the raw stock, such as lumber and sheet metal, can be bought in quantities and stored ahead, since it is purchased in sizes that are suitable for almost any model.

An examination of the methods used in producing several body models for Chevrolet, Reo and Oldsmobile at the Hayes-Iona Company furnishes an excellent illustration of body building practice. The bodies made at this plant include the Chevrolet FB sedans and coupes, Chevrolet 490 sedans and coupes, Reo sedans and coupes and Oldsmobile sedans. The daily capacity of the plant is 65 completely painted and trimmed bodies. The accompanying photographs will aid in describing the routing of work and the progressive production system used in maintaining this production.

It is common knowledge that properly dried lumber is essential to the proper construction of composition bodies. Even though lumber be of the highest quality, it will shrink away at the joints and cause trouble during machining and assembling operations if it has not been properly dried. Such shrinking causes the frame to be weak and unstable, thus putting on the panels undue distortion strains.

Thus adequate kiln facilities are of primary importance, while their location as related to the mill and supply source is a production factor necessary to consider. Fig. 1 shows the kilns used at this plant. Kilns line both sides of the central track, which connects the lumber pile to the mill room.

Two kinds of kiln are used, the compartment kiln and the progressive kiln. In the compartment kiln the moisture is forced through the planks when they are first put in. An attendant watches and records the daily condition of the drying process. In the progressive kiln tiny jets of steam are in continuous operation at one end of the kiln. The planks go in at this end and daily progress toward the opposite end. By the time they have

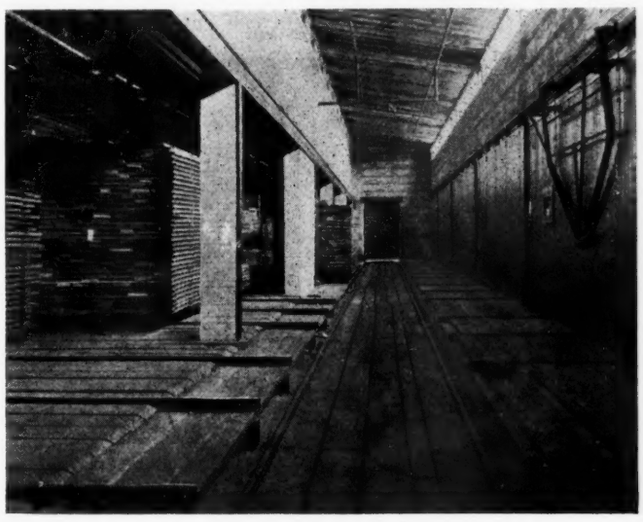


Fig. 1—Dry kilns

Fig. 2—Mill room, showing cut-off saws

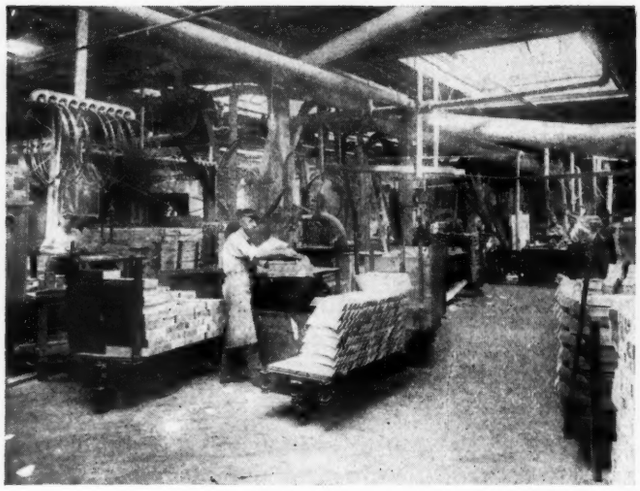


Fig. 3—Mill machine room, showing band saws

Fig. 4—Mill finished stock room

passed clear through the kiln they are dry and ready for removal.

The capacity of these kilns is 18,000 feet per day. The mill room requires approximately 300 feet for every closed body, though the exact requirements vary with different models.

The mill room, shown in Fig. 2, is adjacent to the kilns. In the mill room the planks are cut into lengths for machine operations. The band-sawing operation is shown in Fig. 3, while Fig. 4 shows the dressed stock ready for the frame assemblers. Fig. 5 shows the frames completely assembled and ready for the panelers. The following machines are shown in Fig. 3:

4—Swing cut-off saws.
4—Band rip saws.
3—Planers.
2—Automatic feed jointers.
2—Linderman machines.
1—Double end tenoners.
4—Single end tenoners.
4—Multiple boring machines.
3—Single boring machines.
3—Hollow chisel mortisers.
1—Chain mortiser.
4—Routers.
3—Stickers.
8—Band saws.
8—Mitre saws.
10—Shapers.
1—Sill shaper.
1—Sill gaining machine.
2—Screwing machines.
2—Sand belts.
1—Band resaw.

Many of these machines are motor driven, and others are being similarly equipped as rapidly as conditions warrant the change.

Figs. 6 to 16 illustrate various phases of the progressive production system. Each photograph is adequately explained by its caption, and a study of the group in the order indicated will bring out the various steps in production.

The actual work of production starts simultaneously in the mill department and in the metal stamping and forming department. The layout of the department may be likened to an inverted letter Y, the two departments named being at the extreme ends of the angle. The paneling department is at the apex of the angle. From this point onward the various departments are laid out in a straight line.

Drawings and specifications are made up, of course, in the engineering department. From here they are forwarded to the sample and tool rooms. There the patterns, templates, jigs and forms are made and tested. They are then released to the production departments that require them.

Raw metal stock room is shown in Fig. 7. Here enough metal is stored to produce 50 closed bodies per day. The metal is chiefly 22 gage, approximately 1/32 in. in thickness and weighs 1½ lb. per square foot. Each body

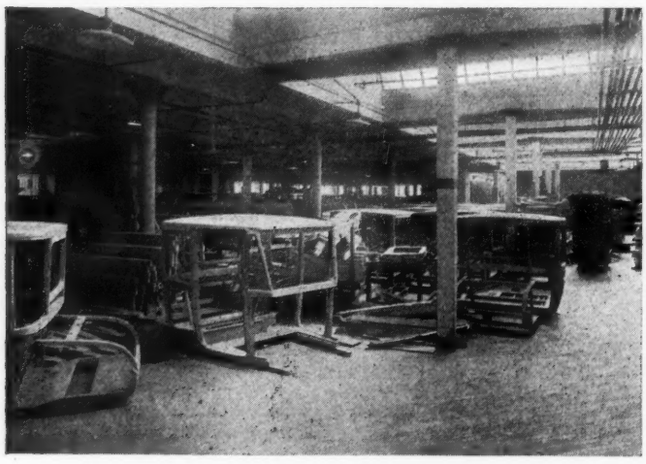


Fig. 5—Framing department

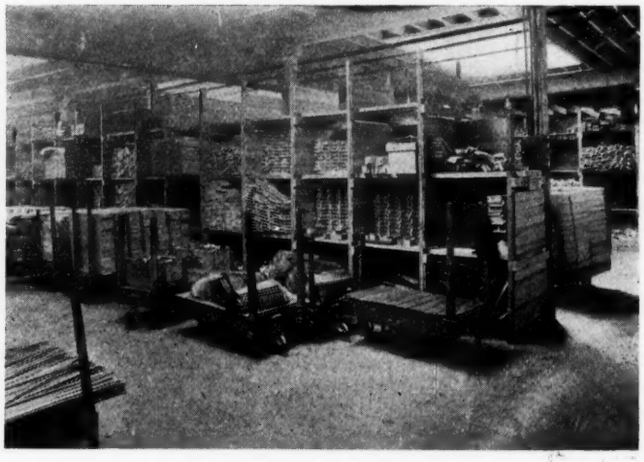


Fig. 6—Finished stock room

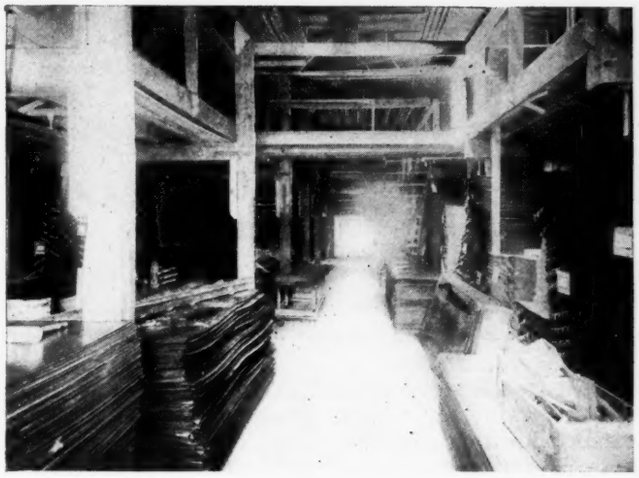


Fig. 7—Metal raw stock room. Fig. 8—Machine used for forming metal shrouds when order is not large enough to warrant making of dies. A form, the shape of the shroud, is placed over a hydraulic ram, and the sheet is laid in this form. The ram forces the form up into the sheet.

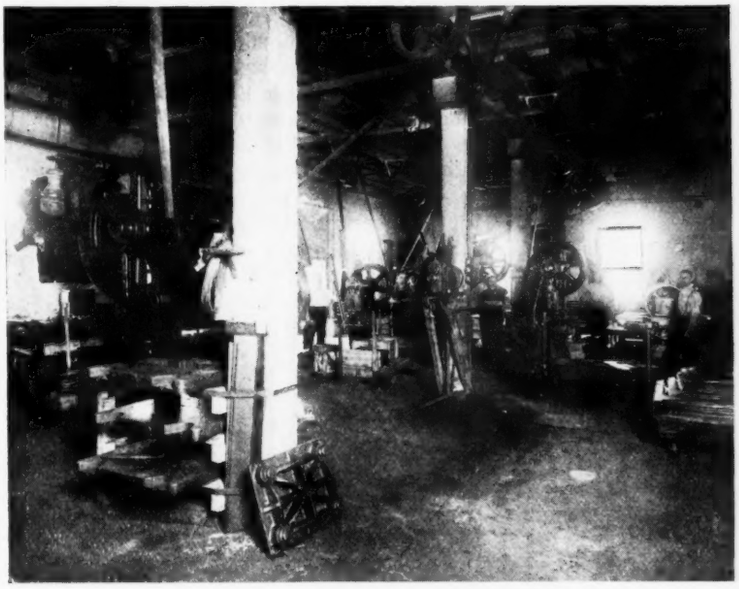


Fig. 9—Metal department

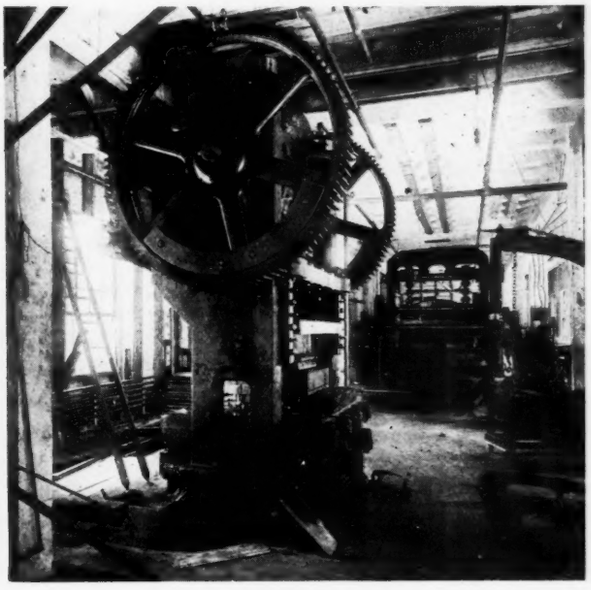


Fig. 10—Large metal presses

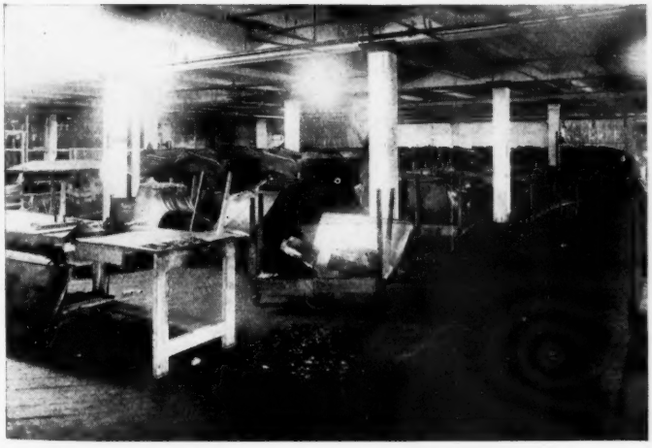


Fig. 11—Finished stampings

Fig. 12—Forming overlay of touring body doors

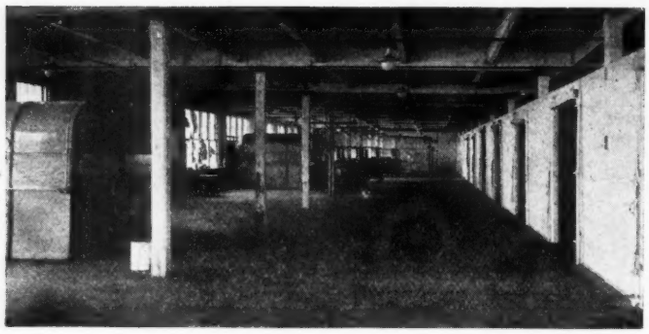


Fig. 13—Paint spray booths and drying ovens

Fig. 14—Cutting operation in trim department

requires for paneling and waste about 240 sq. ft., or 300 lb., of metal. The following machines perform the metal work required:

7—Power hammers.
2—Square shears.
3—Rotary shears.
10—Drill presses.
2—Sets metal rollers.
2—Metal band saws.
4—Spot welders.
2—Heading machines.
7—Acetylene welding outfits.
2—Metal breaking machines.
1—Threading machine.
1—Rattler.
2—Folding machines.
25—Air grinders.
22—Metal forming and punch presses, varying from small punch presses to large forming presses used for the large body panels.
1—Large hydraulic press for shrouds and back panels.

The work is routed as follows:

1. Wood parts are brought from the machine room or frame room, where first assembly takes place, to the paneling room.
2. The metal stamped panels are assembled in the paneling room.
3. The shell is then forwarded to the door hanging room where the doors are assembled. The body is then ready for its first coat of paint.

Before the paint is applied the surface of the panels is treated with a bath of Dioxodene. This preparation is applied with a brush and is then washed off with water. Live steam is then turned on the body and is later dried with compressed air. Thus all corners and moldings are cleaned thoroughly. Since Dioxodene is detrimental to paint, the cleaning process must be performed very carefully. This method of cleaning has superseded the use of the sandblast, because the sand occasioned trouble in the hinges and other parts. The sand cleaned the rust off satisfactorily, but added another trouble more difficult to overcome.

The paint spray booths and drying ovens represent a saving in time of from 40 to 80 hours over methods formerly used. The heat is applied from 160 to 180 deg., and the time consumed in completely painting the body is seven or eight days. The painting process is carried as far as the first color varnish. The final rubbing down and varnish is put on by the customer after the shipment has been received at the home factory.

From the paint shop the body goes to the trim shop and from there to the final assembly department, where the glass, windshield and mountings are put on. Then, after a final inspection, the bodies are ready for shipment.

THE Trompenburg Automobile Works of Trompenburg, Holland, manufacturers of the Spyker six-cylinder car, have secured a license from the Mathis Automobile Co., Strasbourg, Alsace, for the manufacture in Holland of the small four-cylinder 2.36 x 3.94 in. Mathis car.

Fig. 15—(Above)—Finished bodies

Fig. 16—(Right)—Interior view of finished body

Exports of Automobiles and Tires for May, 1921

COUNTRIES	COMMERCIAL				PASSENGER				Parts	TIRES			All Other Tires
	Complete Cars		Chassis		Complete Cars		Chassis			Casings	Inner	Solid	
Europe													
Austria	...	.....	...	.....	9	$ 4,837	..	.....	$ 1,234	.....	.....	.....	.....
Azores and Madeira Is.	...	.....	...	.....	.....	.....	..	.....	26	.....	.....	.....	.....
Belgium	...	.....	12	$ 5,395	17	12,511	..	.....	3,834	$ 85	$ 21	.....	.....
Bulgaria	...	.....	...	.....	1	600	..	.....	.....	.....	.....	.....	.....
Czechoslovakia	...	.....	...	.....	.....	.....	..	.....	.....	6,049	575	.....	.....
Denmark	...	.....	2	2,800	12	16,860	..	.....	4,646	10,219	183	.....	.....
Finland	...	.....	...	.....	3	3,000	..	.....	4,005	1,219	116	.....	.....
France	...	.....	...	.....	5	15,700	..	.....	17,330	8,767	.....	.....	.....
Germany	...	.....	...	.....	4	8,295	..	.....	1,380	.....	.....	.....	.....
Gibraltar	...	.....	...	.....	1	2,050	..	.....	.....	.....	.....	.....	.....
Greece	...	.....	...	.....	.....	.....	..	.....	3,256	7,932	97	.....	.....
Hungary	...	.....	...	.....	.....	.....	..	.....	266	.....	.....	.....	.....
Iceland and Faroe Is.	...	.....	...	.....	.....	.....	..	.....	216	.....	.....	.....	.....
Italy	...	.....	2	899	5	6,975	..	.....	97,169	.....	.....	.....	.....
Malta, Goza, and Cyprus Is.	...	.....	...	.....	23	10,003	..	.....	120	.....	.....	.....	.....
Netherlands	12	$ 12,738	5	4,798	53	52,224	..	.....	11,043	2,491	305	$ 118	$ 12
Norway	1	650	...	.....	10	14,245	..	.....	13,191	84,114	1,669	930	113
Poland and Danzig	...	.....	12	10,176	11	5,299	10	$ 4,497	813	.....	.....	.....	.....
Portugal	1	3,650	...	.....	1	1,607	..	.....	1,183	2,338	.....	.....	.....
Roumania	...	.....	...	.....	2	3,241	..	.....	7,390	131	14	.....	.....
Russia in Europe	...	.....	...	.....	7	10,864	..	.....	.....	.....	.....	.....	.....
Spain	1	2,380	...	.....	35	66,796	2	1,820	14,458	1,874	320	156	.....
Sweden	1	600	...	.....	110	138,102	1	300	21,183	48,024	7,101	5,109	.....
Switzerland	...	.....	...	.....	45	61,951	..	.....	3,341	2,503	31	.....	.....
Turkey in Europe	...	.....	...	.....	15	7,691	..	.....	2,408	.....	.....	.....	.....
England	...	.....	...	.....	66	117,474	..	.....	428,089	77,986	5,794	5,006	.....
Scotland	...	.....	...	.....	2	920	..	.....	698	.....	.....	.....	.....
Ireland	...	.....	...	.....	1	275	..	.....	50	.....	.....	.....	.....
Jugoslavia, Albania, etc.	...	.....	1	150	6	4,685	1	375	1,291	.....	.....	.....	.....
North and South America													
Bermuda	...	.....	...	.....	.....	.....	..	.....	.....	18	.....	51	105
British Honduras	...	.....	...	.....	1	640	..	.....	407	381	58	.....	.....
Canada	83	141,139	72	172,064	1,018	1,486,669	3	5,659	1,888,915	242,285	26,430	3,896	2,385
Costa Rica	...	.....	...	.....	1	1,650	..	.....	647	876	190	80	.....
Guatemala	1	3,080	...	.....	9	11,910	..	.....	3,597	926	368	.....	.....
Honduras	...	.....	...	.....	2	873	..	.....	1,789	1,692	273	.....	.....
Nicaragua	...	.....	...	.....	.....	.....	..	.....	61	1,117	77	.....	50
Panama	...	.....	...	.....	.....	.....	..	.....	2,153	7,108	2,554	34	849
Salvador	...	.....	...	.....	.....	.....	..	.....	1,631	103	.....	.....	.....
Mexico	101	143,101	10	16,231	559	407,974	8	7,328	135,071	84,765	9,459	3,407	4,693
Newfoundland and Labrador	...	.....	...	.....	.....	.....	..	.....	1,486	608	36	.....	87
Barbados	...	.....	1	600	9	5,148	1	300	2,137	1,824	1,034	.....	790
Jamaica	4	11,032	...	.....	7	7,050	..	.....	10,705	16,007	615	2,110	158
Trinidad and Tobago	...	.....	4	4,663	1	1,634	..	.....	4,605	2,810	235	815	43
Other British West Indies	...	.....	1	2,539	4	1,601	..	.....	2,523	825	255	45	404
Cuba	10	26,186	9	3,147	65	48,413	..	.....	74,865	76,365	10,750	29,304	1,391
Virgin Islands of U. S.	...	.....	...	.....	1	421	..	.....	1,382	962	293	.....	92
Dutch West Indies	...	.....	...	.....	1	490	..	.....	569	836	101	.....	.....
French West Indies	...	.....	...	.....	.....	.....	..	.....	2,356	.....	32	.....	.....
Haiti	...	.....	...	.....	.....	.....	..	.....	149	1,150	255	.....	.....
Dominican Republic	3	10,080	...	.....	7	5,325	..	.....	2,679	11,275	1,339	.....	393
Argentina	...	.....	2	4,877	3	10,175	..	.....	73,508	29,406	6,278	3,793	.....
Brazil	...	.....	...	.....	8	16,400	..	.....	10,325	6,150	209	755	.....
Chile	...	.....	...	.....	.....	.....	..	.....	9,147	1,608	37	.....	.....
Colombia	1	840	2	945	11	10,520	..	.....	18,948	3,761	430	114	789
Ecuador	...	.....	...	.....	.....	.....	..	.....	869	328	.....	.....	.....
British Guiana	...	.....	2	984	.....	.....	..	.....	1,268	190	.....	.....	.....
Dutch Guiana	...	.....	...	.....	.....	.....	..	.....	181	.....	.....	.....	.....
Peru	...	.....	...	.....	1	1,000	..	.....	5,527	6,718	667	.....	.....
Uruguay	...	.....	...	.....	.....	.....	..	.....	4,517	16,710	410	522	.....
Venezuela	1	3,138	...	.....	2	4,351	..	.....	11,322	5,324	572	.....	.....
Asia and Far East													
Aden	...	.....	...	.....	.....	.....	..	.....	205	150	.....	.....	.....
China	...	.....	...	.....	3	23,566	..	.....	18,550	4,408	301	527	.....
Chosen	...	.....	...	.....	.....	.....	..	.....	463	.....	.....	.....	.....
British India	...	.....	...	.....	12	13,656	..	.....	21,627	6,996	121	7,174	.....
Straits Settlements	...	.....	...	.....	.....	.....	..	.....	12,332	9,525	2,470	4,589	492
Other British East Indies	...	.....	...	.....	.....	.....	..	.....	199	.....	.....	.....	.....
Dutch East Indies	...	.....	14	39,970	10	34,750	..	.....	49,659	58,762	2,928	18,477	.....
French Indo China	...	.....	...	.....	.....	.....	..	.....	195	.....	.....	.....	.....
Hongkong	11	25,615	...	.....	13	17,182	..	.....	1,366	305	18	.....	3,707
Japan	14	35,640	7	24,043	19	27,388	..	.....	24,250	3,355	.....	94	.....
Persia	...	.....	...	.....	1	1,900	..	.....	1,803	.....	.....	.....	.....
Siam	...	.....	...	.....	8	11,810	..	.....	1,870	316	.....	.....	.....
Turkey in Asia	...	.....	3	3,899	48	25,899	..	.....	4,476	3,592	487	.....	.....
Australia	7	18,420	17	23,977	9	18,633	57	63,359	59,161	20,285	3,375	2,262	237
New Zealand	...	.....	4	11,388	28	37,782	..	.....	30,859	18,730	1,025	4,814	6
Other British Oceania	...	.....	...	.....	.....	.....	..	.....	233	1,906	394	.....	.....
French Oceania	...	.....	...	.....	3	3,100	..	.....	2,710	917	82	760	60
Other Oceania	...	.....	...	.....	.....	.....	..	.....	963	1,356	51	51	.....
Philippine Islands	...	.....	3	5,400	6	13,756	..	.....	15,208	17,620	3,227	13,804	8,301
Africa													
Belgian Kongo	...	.....	...	.....	.....	.....	..	.....	895	.....	.....	.....	.....
British West Africa	...	.....	...	.....	10	11,799	1	1,200	4,216	4,924	596	.....	.....
British South Africa	2	2,362	5	4,220	5	6,303	..	.....	32,808	3,585	.....	.....	.....
British East Africa	...	.....	1	3,000	26	29,808	3	2,209	3,007	3,000	921	.....	.....
Canary Islands	5	2,248	...	.....	2	3,504	2	635	322	.....	.....	.....	.....
French Africa	...	.....	...	.....	.....	.....	..	.....	2,110	307	12	.....	.....
Kamerun, etc.	...	.....	...	.....	.....	.....	..	.....	10	.....	.....	.....	.....
Morocco	...	.....	12	5,335	31	14,607	..	.....	2,160	.....	.....	.....	.....
Portuguese Africa	...	.....	...	.....	1	510	..	.....	21	174	.....	.....	.....
Egypt	...	.....	...	.....	1	1,250	..	.....	1,086	5,717	61	.....	.....
Total	259	$442,899	203	$351,800	2,390	$2,885,652	89	$87,682	$3,204,723	$941,880	$95,243	$108,797	$25,157

A Definite Step in Motor Transportation Educational Work

A course at Syracuse University is taking up motor transportation problems from the business and economic viewpoint. The students make practical investigations as well as consider fundamental factors. Such courses may be nuclei of valuable data for the industry in the future.

CONSIDERABLE attention has been attracted to the educational features of highway transportation through the formation and efforts of the Highway and Highway Transport Education Committee. This body, formed through the co-operative efforts of the automotive industry, the Government, and other interested agencies, has concerned itself in the encouragement of highway transport engineering education, both in the way of engineering courses and of general appreciation of the possibilities and advantages of highway transportation.

The necessity for trained men understanding the problems of highway engineering and transportation has become very apparent and various efforts are being made to provide such men. Most of the definite educational efforts have thus far been concerned chiefly with the engineering phases of the problem. Michigan, Pennsylvania, Harvard, Minnesota, and other universities have given courses, of greater or less length, along this line.

There is another important side, however, to the problem of motor transportation. An almost virgin field is presented for research concerning actual transportation costs, the economics of truck performance under given circumstances, in given industries, and under given load conditions. A few truck companies are doing extensive work along these lines in connection with their own product. These efforts, while of rather broad scope in a few cases, must necessarily be aimed directly at immediate truck sales. The data and experience gained by the various companies will aid materially in developing the literature and scientific information necessary, but it will probably be necessary to look to some more disinterested agency for the broader phases of research.

Because of this situation the course in transportation being given at Syracuse University is worth the attention of the industry. This course begins its second year in the fall of 1921. The chair of transportation in the School of Business Administration at Syracuse University was endowed by H. H. Franklin, and the study has gone forward under the direction of Prof. Charles Lee Raper, who has had a very extensive experience in transportation work.

This course has approached the problem of motor transportation from the business and economic viewpoint. It has endeavored to establish the relation of the motor vehicle to other forms of transportation, to determine the cost of operating motor vehicles under certain conditions, and to establish the economic value of the truck as a transportation unit.

The entire course takes up four main topics, namely,

1. Railroad transportation.
2. Water transportation.
3. Motor transportation.
4. Public utilities.

These major topics are supplemented by specific studies in the following:

1. Traffic.
2. Rates.
3. Ports and Terminals.

While the automotive industry is, of course, chiefly interested in the motor transportation phase, the above outline indicates that the function of the motor vehicle is being considered in its proper relation to other forms of transportation. There is a distinct practical value in this, since the field of the motor truck must be defined either in competition or in co-operation with that of other forms of freight and passenger transportation.

In the motor transportation course the principles of motor transportation are discussed, together with its industrial significance. Considerable time is given to a study of truck operating costs. In discussing operating costs, the first thing is to analyze the factors which enter in to making costs. These factors are outlined and discussed, and an attempt is made to establish their proper relation to each other.

The students are required to apply this analysis to some specific case. Last year a number of interesting papers were written by the students concerning truck operating costs and the use of motor trucks in specific industries. One paper, for instance, dealt with the costs, methods of routing, and operating a fleet of trucks for a large baking concern in Long Island. The fleet operated over a distance of some 60 miles and presented an interesting and complex problem for analysis.

The course also takes up the field of the motor truck in a general way. The possible uses in a city, in territory surrounding a city for 50 or 75 miles, and in rural territory. All the factors affecting truck use under these varying conditions are discussed and the field of the motor truck as a transportation unit is fully analyzed.

The relation of truck costs to the various types of highway construction is also taken up, and the students are furnished with the results of the best available tests along this line. Great care has been taken, however, in every phase of the work, not to lay down as fixed rules and as final information any data or factors concerning which there is still considerable debate.

Since this is the case with much of the data concerning motor transportation, the course presents much material for discussion and has aroused a great deal of interest. Such discussion, based upon actual investigations and studies by the students, is an excellent thing for the cause of truck transportation.

Our colleges and universities have furnished the basis for much industrial research in the past. Leaders of industry have come to recognize the potential value to industry of the professors and investigators in our educa-

tional institutions. It is to be hoped that this course and those conducting it will in the future furnish to the automotive industry much valuable data, based upon extensive research and investigation. Professor Raper is intensely interested in the motor transportation phase, and can be counted upon to visualize the big problems of the industry and to push forward needed research in this field.

Such research cannot be accomplished in a few days or a few months, but the value of such centers of potential information as is furnished by this course should be recognized by the industry. In the meantime, young men are being turned out who have a broad conception of the field of motor transportation; who are certain to spread the gospel of better motor transportation methods whether they directly enter that field or go into business using trucks as part of its transportation equipment.

Next year several older men are going to Syracuse to take this course. One man, for instance, is expected who has had charge of a large fleet of trucks in the Middle West for several years. Men of this kind, working under the direction of a competent instructor, may be expected to give much for the advancement of accurate knowledge and data concerning the business and economic phases of motor transportation.

Shuler Front Wheel Brake

A DESIGN of front wheel brake has been evolved by the Shuler Axle Mfg. Co. and embodied in a front axle for trucks manufactured by that concern. Heretofore front wheel brakes have been spoken of mainly in connection with passenger cars, but it is obvious that they possess considerable advantages when applied to trucks, especially in the case where the truck is used to haul trailers behind it. Powerful brakes are really essential on trucks, because so many of them are operated in the congested sections of the large cities where the chances of collision are great.

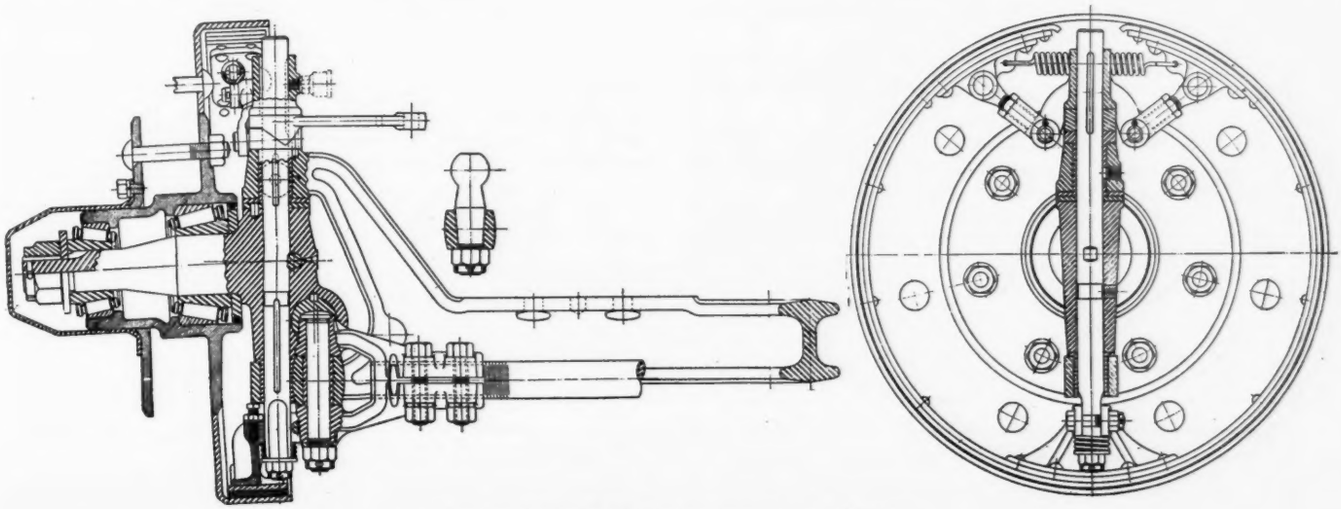
The Shuler brake is of the internal expanding, toggle-operated type. Adjustment required to compensate for wear of the brake lining is made by changing the length of the toggles. The links are hinged to lugs riveted to the brake band near its ends, and they also connect to a two-armed spider, the hub of which is adapted to slide up and down on an extension of the knuckle pin. The knuckle pin is keyed to the knuckle with a tapered key and turns with it, the upper and lower members of the axle yoke being suitably bushed. The bushing in the upper member is provided with a head forming a face cam or end cam, and the brake lever arm, the hub of which is inserted between this bushing and the two-armed spider, is formed with a similar end cam engaging with the former. Any pull on the brake lever causes it to turn around the pivot axis and at the same time to rise on the knuckle pin, carrying with it the two-armed spider and spreading the ends of the brake band through the intermediary of the toggle links. When the front wheel is swung around in steering, the brake lever with its end cam, and the bushing in the steering yoke remain stationary, and the brakes, therefore, are not affected by the steering action.

The axle to which these front wheel brakes are fitted is of 2 and 2½ tons capacity. It has a drop forged I-section center of .30 to .40 per cent carbon steel, heat-treated. Chrome nickle steel is the material from which the steering knuckle is forged, and the steering arms are of the same material. The hubs are of malleable iron and the caps and flanges of pressed steel. The materials used for the brake parts are as follows: Knuckle pin, 3½ per cent nickel steel; drum, pressed steel; band, strip steel rolled to a true circle and lined with asbestos fabric; cam bushing, cold drawn steel, carbonized, hardened and ground; brake lever, No. 1035 S. A. E. steel, drop forged and heat-treated; toggle eyes and links, drop forgings; band fittings, malleable iron. The cam surfaces are true helical surfaces.

Viscosimeter Conversion Chart

A USEFUL chart for converting readings on one make of viscosimeter to readings on other makes of instrument is contained in *Lubrication* for May, 1921. Use of the chart is fully explained. Saybolt, Redwood, Engler and Barbey curves are included and conversion from one to the other scale made as convenient as possible. The scale used is one of kinematic viscosity which is defined as the ratio obtained by dividing the absolute viscosity by the specific gravity at the same temperature.

Another issue of the same publication quotes results of tests recently published by the Advisory Council of the British Department of Scientific and Industrial Research, which show that the viscosity of oils increases rapidly with increase in pressure. In the case of some oils tested increase of pressure to 5000 lbs. per sq. in. increases the viscosity 125 per cent.



Sectional views of Shuler front wheel brake

The FORUM

Improvements in Fuel Utilization

Editor, AUTOMOTIVE INDUSTRIES:

What impresses me most about this matter of petroleum fuel conservation is the rather minute effect which all our discussions and research have upon the policy of some of the engineering departments of the automobile industry. In general, all car makers would like to get better gasoline mileage, provided the carburetor alone will do it, but many will not change their stereotyped designs nor concede even 1 per cent in any detail of power or speed demonstration to lower their fuel consumption. Similarly it appears that the lower priced car manufacturers at the present time can scarcely afford to spend very much for better carburetors or for new tooling equipment to produce changes of construction which would give better efficiency. To me it appears that a general improvement will come only when forced by a pronounced increase in the price of fuel. The situation is somewhat different with regard to trucks and all the makers of the better class of trucks are really interested in obtaining the most efficient operation possible.

The various means of increasing fuel efficiency being applied in the industry, which I have been able to observe, may be subdivided under three heads: Lowering the fuel consumption by change of engine cycle, by improving the mechanical efficiency and by improvements in carburetion and manifold design.

Changes Affecting the Engine Cycle

Under changes in the engine cycle would come raising the compression, with some special means of avoiding detonation. Raising the compression seems to improve the fuel efficiency even more at part throttle than at full load, possibly because it not only gives a greater expansion ratio but also in the former case reduces by a greater percentage the volume of exhaust diluents in the attenuated throttled mixture.

The methods of avoiding detonation are as follows:

1. Delayed intake valve closing, which requires careful experiment to avoid loss of power and give proper speed graduation.

2. Injection of water as used on some tractor motors, which is an annoyance because the water consumption is almost equal to the fuel consumption.

3. Injection of cooled exhaust as proposed by Ricardo. I have had little success with this latter method with our heavier fuels which seem to burn inevitably with a carbon residue, because introduction of exhaust increases very rapidly the carbon deposits in the cylinder. I know of no instance of successful use of this method.

4. Control of the carburetor throttle according to speed in such a way as to restrict the charge slightly at low speeds, when detonation is most apparent and objectionable. This method is somewhat similar to that of delayed intake valve closing and is being experimented with by a few companies at the present time.

Another change affecting the nature of the indicator diagram is in the use of some method of control other than the carburetor throttle, that will avoid the suction pumping loss. I refer to the loss on a part load indicator card as indicated in Fig. 1. The most obvious way of eliminating this loss is by reducing the torque by early closing of the intake valve, giving a card as shown in Fig. 2, or late closing of the valve, giving a card as shown in Fig. 3. Instead of actually shifting the camshaft timing a motor driven rotary valve might be placed in the intake manifold. (See Fig. 4). This pumping loss is appreciable on the average car only below 25 miles per hour smooth level road driving and I doubt whether this complication would justify itself.

So far I have observed no definite improvements in engine operation due to changes which should affect the turbulence of the mixture in the cylinder. That is, we know of no especially successful application of the knowledge recently gained regarding this phenomenon.

Mechanical Improvement

The most obvious step to raise the mechanical efficiency of the motor in average driving is the use of the four-speed gearbox. I have heard of few passenger car makers who are changing to a four-speed gearbox on this account, but have heard that certain makers of truck transmissions are planning to bring out an increased number of gear changes. Simplification of the gear shifting operation has received some attention and is worthy of more.

Reduction of the engine friction can be best brought about by careful manufacture, with improved lubrication, and with modified piston design, whereby quietness when cold can be obtained along with free running when hot. There is some activity in regard to pistons, but I think the engine makers are now more pressed to reduce their costs than to improve their construction. There is without doubt a very considerable percentage of loss in the

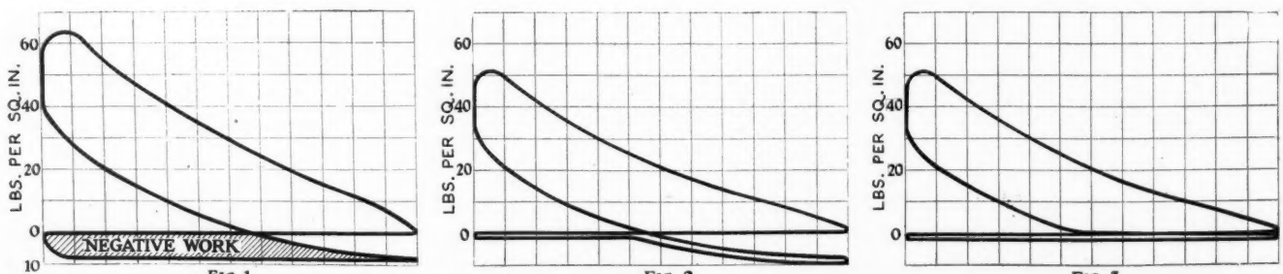


FIG. 1 FIG. 2 FIG. 3

Indicator cards showing effect on pumping loss of valve timing at a load and engine speed equivalent to about 20 m.p.h. level road driving

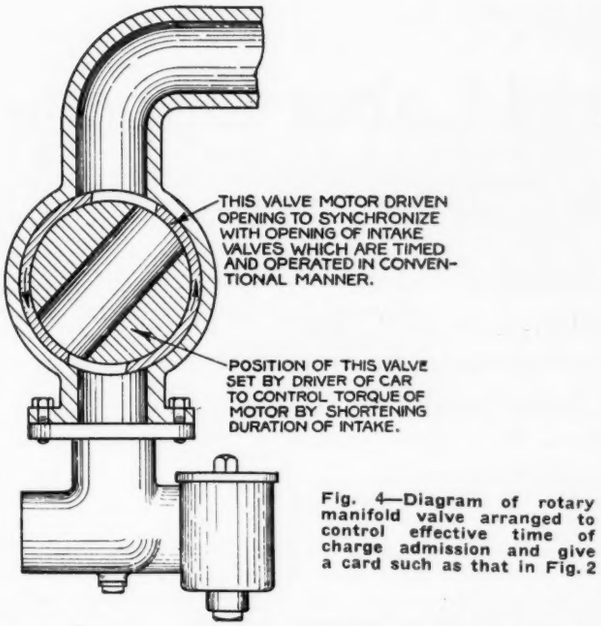

THIS VALVE MOTOR DRIVEN OPENING TO SYNCHRONIZE WITH OPENING OF INTAKE VALVES WHICH ARE TIMED AND OPERATED IN CONVENTIONAL MANNER.
POSITION OF THIS VALVE SET BY DRIVER OF CAR TO CONTROL TORQUE OF MOTOR BY SHORTENING DURATION OF INTAKE.

Fig. 4—Diagram of rotary manifold valve arranged to control effective time of charge admission and give a card such as that in Fig. 2

drive of many cars, which could be eliminated by better design. Part of this loss is in transmitting the power from the wheels to the road, when the roads are rough; for instance, on one car I occasionally drive, the rear axle is hung in such a way that the car cannot go over a bump without sliding the wheels, or suddenly decelerating the car or the engine flywheel; actually a little of each seems to take place. I am inclined to believe that a number of the axles in use to-day have considerably more friction, with the weight of the car on them, than we think; at least there is a very great difference in the drawbar pull per ton required to move different cars.

Improvements in Vaporization and Distribution

The application of exhaust heat and maintenance of adequate mixture temperatures, as outlined in the recent S. A. E. Fuel Committee Report, seems to give practically the full efficiency possible with present engines, under steady running conditions after the engine is warmed up. In cold weather, however, there are long periods when the manifold temperature is not adequate and at such times there is considerable fuel waste. Also, with the manifold design recommended in the S. A. E. Fuel Committee Report, there is a small percentage but considerable amount of fuel going to the motor in the liquid state, as brought out by Mr. Dorris' paper and the discussion following it at the recent Summer S. A. E. Meeting. Mr. Dorris has shown one way of taking care of this.

We are just completing experiments with a fuel heater to be connected between the intake manifold and the carburetor. This device separates the unvaporized fuel from the mixture and throws it down into a separate chamber on a thin copper floor over the exhaust. The fuel then comes out of this chamber as a white and greasy fog. As might be expected, there is considerable saving in fuel, no crankcase dilution and reduced carbon deposit, but the most noticeable effect is that the engine fires very much more smoothly under adverse conditions such as usually exist in the average car after the unskilled driver has had it, while, for example, improperly spaced ignition points, slightly leaking valves, etc. With this system the engine operates satisfactorily on heavier fuel than kerosene, except for the trouble of detonation. As pointed out at West Baden, with this system there is no problem of distribution or of proper manifold size; the intake manifold can be cast in the cylinder block as large as desired and of any contour that will make a smooth external shape. Before heavy fuels can be regularly used, however, we must solve the problem of detonation, also of special means for starting.

Regarding the carburetor as a metering device, there is scarcely room for pronounced further improvement. Some engineers seem to be quite definitely convinced that the coming development is toward higher motor speeds and smaller displacements and that this will change the trend of carburetor design. Irrespective of the carburetor proposition, I believe this idea is wrong, but in any case, I am quite sure that so long as the present type of motor is continued, there will be room for detail improvements only in the better types of carburetors now used. The carburetors used on some of the lower priced cars could be considerably improved.

I know of but few makers who have made any effort toward furnishing replacement parts to improve the fuel efficiency on cars already out. This is a very important matter and it is unfortunate that so few manufacturers have given attention to it.

F. C. MOCK, Engineer,
Stromberg Motor Devices Co.

Distribution of the Automotive Vehicles in Surplus War Materials

THE Bureau of Public Roads of the U. S. Department of Agriculture has made the following statement of allotments and deliveries of trucks, Fords and other cars from surplus war materials to the several States, and retained by Department of Agriculture to June 1, 1921:

State	Total Vehicles Allotted	Trucks Delivered	Fords Delivered	Other Cars Delivered	Total Vehicles Delivered	Per Cent Delivered
Alabama	562	439	55	3	497	88
Arizona	366	277	22	3	302	88
Arkansas	450	389	40	1	430	95
California	816	601	75	14	690	85
Colorado	465	377	40	5	422	91
Connecticut	163	128	15	3	146	90
Delaware	44	50	7	5	62	..
Florida	307	235	33	5	273	89
Georgia	722	580	133	10	723	..
Idaho	326	271	24	8	303	93
Illinois	1,172	910	110	23	1,043	89
Indiana	722	561	81	10	652	90
Iowa	776	596	65	4	665	86
Kansas	770	606	81	5	692	90
Kentucky	520	404	49	6	459	88
Louisiana	364	278	36	7	321	88
Maine	260	177	25	3	205	79
Maryland	234	208	15	5	228	97
Massachusetts	395	201	23	2	226	57
Michigan	776	656	76	11	743	96
Minnesota	760	502	54	6	642	85
Mississippi	480	378	46	6	430	90
Missouri	910	680	69	11	760	84
Montana	535	397	42	4	443	83
Nebraska	570	439	63	8	510	89
Nevada	345	218	20	6	244	71
New Hampshire	112	96	10	2	108	96
New Jersey	320	299	56	13	368	..
New Mexico	430	344	29	0	373	87
New York	1,333	1,014	124	12	1,150	86
North Carolina	610	471	76	5	552	91
North Dakota	410	299	30	4	333	81
Ohio	992	774	96	21	891	90
Oklahoma	620	455	43	4	502	81
Oregon	424	304	28	6	338	80
Pennsylvania	1,229	837	113	23	973	79
Rhode Island	62	45	3	2	50	81
South Carolina	385	303	41	5	349	91
South Dakota	435	324	46	4	374	86
Tennessee	606	462	75	7	544	90
Texas	1,567	1,176	127	34	1,337	85
Utah	304	238	22	1	261	86
Vermont	122	96	7	2	105	86
Virginia	530	390	48	10	448	85
Washington	390	302	37	7	346	89
West Virginia	286	224	21	6	251	88
Wisconsin	680	459	47	15	521	77
Wyoming	326	229	24	4	257	79
Agriculture	2,000	1,336	368	72	1,776	89
Totals and averages	27,983	21,115	2,770	433	24,318	87

Overcoming Organized Labor Opposition by Fairness

The British coal strike has shown the difficulty of industrial adjustment where completely organized forces are opposed to each other. Similar development may occur here unless broad-minded, fair methods prevail among employers. A shop closed against union men is not an open shop.

By Harry Tipper

THE reports of the end of the British coal strike indicate that for a time, at least, the question of nationalization of mines and the national pooling of wages is out of the way in that country. It would be a mistake to suppose, however, that the question is definitely shelved. The adherence of the main body of the miners to their leaders through the stress and difficulty of this strike is an indication of the solid character of the union organizations and the probability that the compromise accepted is accepted as an interim agreement only.

Meanwhile the strike in some of the other mines, difficulty with various portions of the textile trades and other agitations show the general tendency of the labor unions to continue their demands and to force the manufacturers into giving up more or requiring the public to pay more. Although there was no insistence among the leaders of the coal miners for a nationalizing of mines in this particular strike, the attempt to enforce a national pool for wages was so definitely in that direction that it must be considered a part of the same program.

The settlement indicates that the subsidies will be continued for three months in less amount, so that the people of Great Britain are paying for the settlement of this strike in the form of taxation for the support of the coal mining industry. These elements of the situation in Great Britain are of interest to us because they show the difficulty of adjustment and the tendency to industrial disruption in a completely organized industrial country where the forces of organization are opposed.

Despite the employment of the Whitley councils and the settlement of many minor strikes through this machinery, the difficulties of agreement between unions and employers' groups are not reduced by the complete development of both sides into organized groups frankly and definitely opposed in their ideas and methods of treatment. These things indicate also the tendency of strongly organized groups to continue their pressure upon government without respect to the economic conditions or the effect of their actions upon the economic development.

Considering the depressed state of trade in Great Britain, the number of people without employment, and the general hardship to be endured among many sections of the populace, one would be inclined to think that the pressure of demand would decrease and the groups would tend to come together for the time being in the common necessity for the reduction of costs and the enlarging of production.

When the organized forces reach practically their maximum of development with their programs of development thoroughly worked out, the momentum required in the course of this definition exerts a pressure on the leaders to continue their movement without regard to its present effect. To a much larger extent than we realize, the development of British commerce in the next few years and the political attitude to be taken in international questions depends upon the settlement of the political industrial program and the position of the labor party in regard to it.

Under the present conditions of the United States, we are likely to over-estimate the effect of the economic conditions upon the organized groups of workers and their development. The development of the open shop movement is a case in point. Where the open shop has been established and continued so that it is in advance of the trade union and is organized with the spirit and practice of square dealing, it offers good hope for the future. In many cases, however, the open shop is merely a means of escape from the union and a means of throwing the union out of the shop.

In discussing this matter with a friend of mine the other day, he informed me that he had come out for the open shop at the beginning of the year and was obliging all his workers to give up their union cards. "Why do you want them to give up their cards?" I asked. "Nobody can work in my shop and belong to a union," he said. "It's an open shop." This man really thought he was running an open shop, whereas he was just operating a shop closed to union men, and in so doing he was adopting the policy of the union, but turning it against the union.

Methods of this kind do not destroy the organization of workers. Men do not organize for insignificant reasons and they do not lightly reject their possibilities of organization. In times of distress they may subdue their desire or give up the idea entirely because of their fear of starvation. Unless they have confidence in the manufacturers and the management to give them a square deal, they will organize just as soon as there is any advantage in doing so, and they will organize more strongly as the necessity grows.

We do not want to reach a stage in this country representing the highly organized condition now existing in Great Britain. It would be unfortunate if we were obliged to adopt such clumsy and cumbersome machinery for the settlement of disputes. It would be a very great misfortune if we were to

arrive at the place where the organizations were so definitely opposed and equal in strength as to make settlement impossible.

Both these eventualities are possible in this country. If we succeed in diverting the industrial organization into other channels, it will be because of the intelligence, understanding and spirit of fairness among the manufacturers so that they manage their shops with equal justice to all concerned, whether they are members of unions or not, with some real understanding of the workingman's difficulties and ideas and with some comprehension of his fundamental necessities.

With those standards in view sufficient progress will be made in a few years to prevent the further development of separate organizations as the industrial prosperity grows. Unless intelligence of this kind is used, returning prosperity will show an increase in the number of unions and in the membership of those unions, whether they be trade unions or unions of another character.

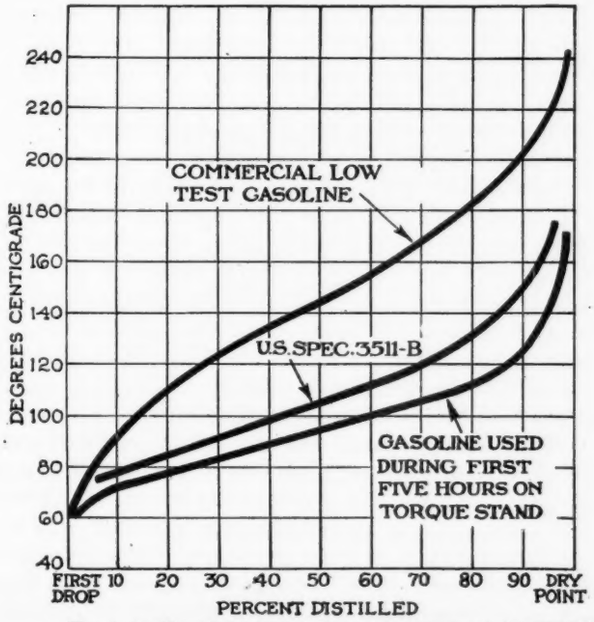
The leaders of the workers must come out from among the executives or from among their own ranks. They have leaders from among their own ranks who have been of value and visible usefulness to them. Temporarily they are not able to control the situation and are willing to accept what is necessary. This, then, should be used by the management of industry to show the workers there are leaders in industry capable of leading the whole establishment, including the workers, worthy of their confidence and trust, and more intelligently concerned with their future. This sort of leadership is the best guarantee against the conflict of trade union against manufacturers' group so painfully apparent in the difficulty experienced in Great Britain.

Effect of Gasoline Quality on Engine Performance

WITH the present design of aviation engines and the means of vaporizing and distributing the fuel now available, commercial low test automobile gasoline does not give satisfactory performance. Detonation obtained with the compression ratios now in use precludes the use of straight, low test fuels unless anti-detonating compounds are mixed with the fuel. For this reason it would appear impractical to use commercial, low test automobile gasoline in present types of aviation engines, except in emergencies.

These conclusions are the result of experiments at McCook Field, which are interesting in view of the fuel situation, particularly as bringing out the fact that present-day gasoline is responsible for rather low engine efficiency. As is well known, the fuel ordinarily used in aviation engines normally has a much lower average boiling and end point than fuels commercially available for general automotive purposes. Distillation curves of the domestic aviation gasoline and commercial automobile gasoline are shown in Fig. 1. The domestic aviation gasoline is the fuel used in the army air service as standard for ordinary flying, but is not composed of as low boiling fractions as those which go to make up the army air service fighting gasoline. The results of the comparative tests which were made on a standard, twelve-cylinder Liberty engine are clearly brought out in the accompanying curves plotted in Fig. 2.

In making the tests, a 5 hr. run with aviation gasoline was made, after which a similar run using the low test gasoline was attempted. This could not be completed until 6 per cent of anti-knock compound, consisting of Xylidine, was mixed with the fuel. The net results of the run are shown, as far as power is concerned, in the curves. After the torque stand runs were completed, an inspection of the pistons, cylinders and valves were made. The carbon deposit on the pistons was heavier than is usually obtained with domestic aviation gasoline. The most objectionable characteristics of the low test fuel is its pronounced tendency to detonate with compression ratios which do not cause detonation with ordinary aviation fuels. A notable increase in carbon deposit and in crankcase dilution was also found with the low test fuel.



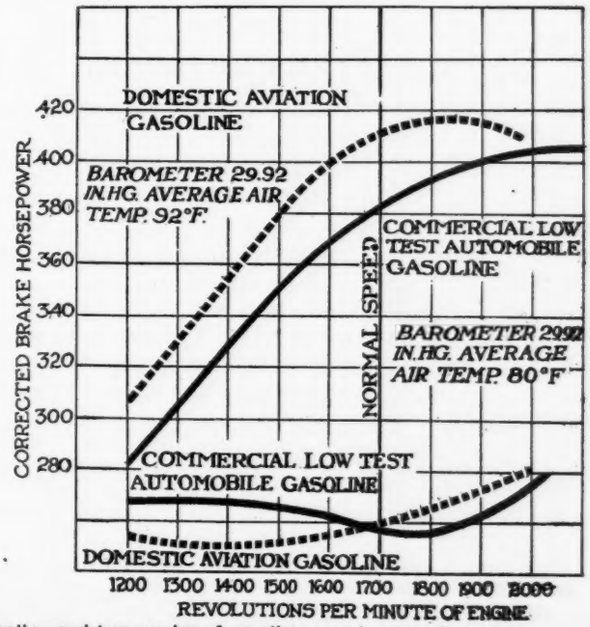


Fig. 1 (Left)—Distillation curves of commercial automobile gasoline and two grades of gasoline used in aircraft engines.
Fig. 2 (Right)—Power and fuel consumption curves, showing performance of Liberty twelve-cylinder aircraft engine using commercial automobile gasoline and domestic aviation gasoline. Results corrected to standard temperature and barometric pressure

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Selling Transportation

THE future of the truck lies in its record of performance as an economical transportation unit. Manufacturers must educate their dealers to sell transportation. Before they can do this the manufacturers themselves must study carefully the factors involved in transportation analysis. The more quickly this is done, the better will be truck progress.

Many of the trucks that have simply been sold as trucks are piling up transportation records unfavorable to the industry. At least they have not been performing as efficiently as if they had been sold after a careful analysis of specific transportation needs.

In a city of 100,000 population in New York, for instance, a recent survey of department store motor hauling showed some interesting facts. All of the six large department stores in the town had motorized their delivery to some extent. But in only one case out of the six had there been made any analysis of routing delays, loading problems, operating costs and the relation of such factors to one another.

The records being made by the trucks of the other five stores would not show truck performance in its best light. It is to the advantage of the manufacturer to study the problem of selling transportation.

A Factor in the Tax Situation

BUSINESS men recently have had placed before them some very startling lessons in economics. The railroads, for instance, have learned that it is possible to erect a rate barrier that will stop shipments of certain commodities. Many other lines have learned that it is quite possible to price an article at a figure that the public simply will not pay.

So it comes to general knowledge that there are other points to be considered in Federal taxes than the mere amount of the tax paid. Along with the popular demand for lowered Federal taxes comes a proposal for a bonus to be paid to the soldiers in the world war. The amount of this bonus will, of course, increase the amount necessary to raise in the form of taxes within the next few years. But there are other points to be considered, and these are well pointed out in a recent letter written by Secretary of the Treasury Mellon to Senator Frelinghuysen. Any transaction that amounts to well over $1,000,000,000 is certain to have a very important economic bearing on many lines of business. This subject is well worth close study on the part of those interested in business in a big way.

Effect of Racing Engines of Small Displacement

THE announcement in last week's AUTOMOTIVE INDUSTRIES that the 1923 Indianapolis race will be confined to cars fitted with two-litre (122 cu. in.) engines has been coupled with the suggestion that similar practice may be later reflected in the design of American cars, since it has already had a similar effect in Europe. We are inclined to doubt the probability of such an effect in this country for several reasons.

In the first place, an engine of this size is suitable for propelling only a very small and light car, a smaller car, in fact, than has ever proved popular in this country. Most of the European cars with engines of this size are in reality diminutive automobiles, many of them with narrow track and small passenger-carrying capacity. Even then frequent gear changing is necessary. It is, furthermore, a difficult and expensive job to build a light car that will stand up on any but the best of roads. By light car we mean a car comparable to the cars with engines of 100 to 125 cu. in. displacement, or thereabout, such as are now quite popular in England.

In the second place, the use of so small an engine involves relatively high engine speed and large gear reductions in order to give the car the requisite ability and road speed, and to build a successful high-speed engine requires a much higher grade of workmanship and much more care in balancing, as well as lighter and more expensive materials, than it is possible to employ in large quantity production of cars designed to sell at a low price. To be really successful a car

of the class referred to must be capable of meeting the competition of the larger and more rugged car produced in quantity at a lower price. The fact that the car is economical in tires and fuel will not offset a much higher first cost, especially if, as is often the case, servicing is more expensive.

In the third place, there is reason to question the claim sometimes made for the efficiency of small high-speed engines as compared to the larger and slower speed types of engine. It is probable that the friction losses are greater, relatively, in the higher speed type. It seems probable also that by a proper selection of gears in the final drive, the larger and slower speed type can be made to operate under more favorable load conditions, and consequently at higher efficiency than the higher speed job. In any case it does not necessarily follow that, because the engine is small and capable of a high rotative speed, it is relatively more efficient.

Members of the Bureau of Standards staff, in a paper read at the recent S. A. E. meeting, presented some data tending to show that larger and slower speed engines are more efficient than the higher speed type, even when the difference in weight of engine and car, in favor of the latter type, is taken into consideration. There is need for further experimental evidence along this line, however, for there is no doubt concerning the desirability of more economical cars, due regard being given, of course, to first cost as well as to operating cost.

Understanding Sales Prospects

THERE has been considerable discussion recently concerning territorial analysis and more accurate determination of future sales possibilities. The purpose of such studies has been, not only to stabilize production, but also to permit the establishment of fairly accurate quotas by which to measure dealer performance. The effect of such efforts on the dealer should be considered. An incident recently occurred which illustrates the good effects of such studies on both dealer and manufacturer.

This manufacturer has done extensive work in commercial research and merchandising analysis. On the basis of these studies he has re-established dealer territory boundaries along scientific lines. The process of readjustment is still under way.

The other day one of the big dealers made application for more territory. He claimed that people from a certain near-by town were coming to him for cars, and that he could not sell them because they were in another dealer's territory. The other dealer, he claimed, was not adequately handling the business.

We happened to be present when this big dealer was discussing with a factory executive the matter of increasing this territory. It was refreshing to listen to the line taken by the conversation. The talk was a discussion; not an argument. The dealer was forced to outline his side of the case in concrete terms on the basis of accurate merchandising facts. He knew that the factory executive had made a careful merchandising analysis of the territories involved; that the factors of population, property values, registrations, incomes, etc., had all been considered. To present his case the dealer had to understand thoroughly all these factors concerning his own territory, to begin with. He had to study carefully the sales possibilities of his own and the adjoining territory and to arrange the results of that study in logical sequence.

We don't know whether or not the dealer got the extension of territory. But it is certain that if he did not get it, he knew that it was refused on the basis of sound sales facts.

When it is possible to discuss such matters on an intelligent basis, good feeling and co-operation are enhanced, and each party to the discussion knows that he has won or lost on a fair and honest examination of fundamental facts. Merchandising studies are beneficial to both dealer and manufacturer. In this case, for instance, whether the dealer got the additional territory or not, he had dug up and understood many valuable facts about his own territory which will be of advantage in future selling.

What Mr. Babson's Figures Told

DURING the recently somewhat gloomy months there was much attention given to the figures of Roger W. Babson. These figures added fog to the gloom. There were a few hardy men who dared to say that they did not believe all that Mr. Babson said of the future. Recently these men may have been fooled into the belief that they were right and Mr. Babson was wrong, but not so. Mr. Babson now comes forward with the true story of what his figures have revealed in the future. He is quoted as follows in a Chicago dispatch to a New York paper:

> Automobiles built of a composition of cotton and operated with coal dust for fuel are a possibility, according to Roger W. Babson, statistician, who is visiting here.
>
> "The principal factor in the decline of the automobile business has been the increase in the price of gasoline," he said. "The car of the future will be run by other fuel. Already the use of coal dust has passed the experimental stage.
>
> "Lighter cars must be manufactured to cut down the cost of production and maintenance. A composition of cotton, formaldehyde and glue is being used to produce a material that may solve the problem."

It is possible that Mr. Babson, like Admiral Sims, may say that the thought is more of the newspaper's reporters than his own, but we hope not. It is so clear and concise a solution of the problems of the automotive industry that we hope he will stand by it and prove it with more figures.

When this solution is proven, the industry's only concern will be as to whether the coal miners are going to strike and how much cotton the planters will plant, and how high the speculators and middlemen will force the prices of the two essential commodities. Of course there will be the railroad problem, but we have that now. How much easier of solution are these two problems than the present one of wondering how much oil there is in the earth and how well the oil refiners are going to prepare it for the engine.

Business Puts Pessimism to Rout

Trade's Evils Less Than Omens of Good

Outlook Points to Certain Revival As Favorable Signs Loom on Horizon

By James C. Dalton

NEW YORK, July 11—There are two outstanding facts about the status of automotive industry as the middle of July approaches:

Business is considerably better than many persons within the industry think it is.

Business is very much better than people in general outside the industry think it is.

Governor Harding recently told the members of the National Automobile Chamber of Commerce that the worst thing about a pessimist was that he usually was pessimistic at the wrong time.

The impression seems to be almost universal among those who have not followed the situation carefully that the automobile trade is suffering from a bad case of the doldrums. The Guaranty Trust Co., for example, the second biggest bank in the United States, in its survey of general conditions for June, has this to say:

"A decline in the demand for automobiles, accompanied by numerous recessions in prices, is reported. The slackening of demand is affecting both truck and passenger car output. About one-third of the companies actively engaged in the production of passenger automobiles in the United States have revised prices downward since April. The recessions in prices have been proportionately larger for the lower-priced cars than for those selling at higher prices.

"A reduction in the demand for automobile tires, corresponding in a measure to the lessened demand for automobiles, has affected the activity of a number of rubber companies. In accordance with curtailment of production schedules, workmen have been laid off.

"Earlier in the year there was a considerable increase of business in the automobile and tire industries, an increase which resulted in exaggerated expectations concerning the immediate future of these industries."

Summary Far from Facts

This summary could not have been much further from the actual facts in relation to June. There was a falling off in sales at retail the latter half of May, but it was not reflected in the factories. Sales in June were larger than for any month of the year thus far, and it was one of the largest Junes in history. There has been no reduction in demand for tires and all the large factories increased their production schedules last month.

"Earlier in the year" there may have been some "exaggerated expectations" concerning the future, but they were not shared by well informed men in the industry. On the contrary, actual conditions as they have developed warranted greater optimism than was felt in most quarters.

It undoubtedly is true that there would have been a sharp slump in sales if prices had not been cut. They were cut, however, and a flood of orders followed.

While it is certain there would have been a slump in sales if prices had not been reduced, it is equally certain that there will be a slump unless prices are stabilized in the very near future. No person to whom money is an object is going to buy an automobile unless he has some assurance that he can't get it $150 or $200 cheaper a month from now.

Reasons for Reductions

Two well known companies in the same class have cut their prices twice in a month. The first company to reduce felt an immediate stimulus in its business. The sales of the second stopped. Then the second company cut, but still sales didn't start, and it made a second cut. Then the sales of the first company slowed up and it made a second cut.

There were many reasons why automobile prices should have been cut, but there is every reason in the world why they should not be cut every two weeks. Such a price war would be ruinous. It would do more than anything else possibly could to check sales. When a man buys even a pair of shoes and then finds that he could have bought them $1 or $2 cheaper a week later, he instinctively feels that someone has made a fool of him, and this engenders a certain amount of animosity toward the maker.

Signs Point to Business

Dog days usually are dull in a business way, but this year they will afford the tired business man and manufacturer an excellent opportunity to scan the industrial horizon and figure out intelligently what's going to happen two or three months from now.

The signs are on the horizon now and it doesn't require superhuman intelligence to read them. The favorable omens greatly outnumber the portents of evil. The fundamentals upon which business and trade rest are stronger than they have been in eighteen months. They point to a gradual but none the less certain business revival in September or October at latest.

There was foolish optimism a year ago and there is needless pessimism now.

Detroit District's June Output 169,041

Steady Upward Trend in Demand Shown by Increased Production at Plants

DETROIT, July 11—Evidence of a steady upward trend in automobile demand, influenced in great measure by price cuts, is shown by increased production for June in Michigan factories. The output aggregated 169,041, an increase of 24,440 compared with May. Production of 108,962 by Ford against Ford output of 101,897 in May is responsible for a third of the increase, but there was a step-up in nearly all factories, particularly Dodge and Buick. Increase in output of Hudson-Essex, Maxwell, Paige, Packard, Studebaker, Chevrolet, Hupp and Olds also were marked, and slight improvement was shown in practically every factory in the district.

Dodge, which built around 450 a day the greater part of June, swung into capacity production during the latter days of the month, and official announcement is made that an average of 600 cars will be run off assembly line daily for the balance of the year. Olds Motor Works turned out 3100 in June against 7175 in May.

Packard went up about 200 in the month, Hudson about 100, Essex about 200, Paige 400, Hupp 250, Chevrolet about 1500, Studebaker about 1000 and Maxwell more than 1600. Buick went more than 6000 ahead of May.

Working on Full Time

Packard, which built 1000 cars and 180 trucks in June, is working full time with slightly less than 50 per cent of the peak force, but officials say if present demand continues, a step-up in production will be imperative. Oldsmobile officials report steadily increasing business and prospects for an exceptionally big demand in July.

General Sales Manager Hutchinson of Hupp Motor Car Corp., said the factory had orders on the books for more cars for July delivery than were turned out in June, with daily demand showing a decided upward trend. The same is true of Paige, at which plant the June production was 400 greater than May.

President McAneeny of Essex Motors said Hudson and Essex factories were turning out 140 cars daily at the present time and would continue that production indefinitely, the output being based strictly on sales requirements, which for the last four weeks have been climbing steadily.

Set $40,000 Sales Promotion Fund

Jobbers Make Plans to Stir Up Buying

Section by Section Development Likely Under Specially Engaged Promotion Director

MACKINAC ISLAND, MICH., July 11—A sales promotion campaign intended to broaden the outlet for products of the automotive equipment industry by educating jobbers, jobber salesmen and dealers in improved merchandising methods was authorized by the Automotive Equipment Association, which adjourned its summer convention here to-day.

The association appropriated $40,000 for the undertaking, $15,000 of which will come from the treasury and the balance from assessments on members, including both manufacturers and jobbers. A permanent committee was appointed to map out the campaign and to employ a sales promotion director and assistants to do the actual work.

On the sales promotion committee, which is to be permanent, were appointed Robert A. Stranahan, president of the association and president of the Champion Spark Plug Co., Toledo; N. H. Oliver, Metal Specialties Co., Chicago; L. R. Safford, McQuay-Norris Mfg. Co., St. Louis; Howard M. Dine, vice-president of the association and head of the Dine-De Wees Co., Canton, Ohio; W. W. Lowe, Electric Appliance Co., Chicago. The first three are manufacturers, the remaining two jobbers. The committee expects to meet in Chicago in the near future and get under way the plans for the new work.

Campaign in Sections

The sales promotion probably will be developed section by section throughout the country with the director and his assistants personally presenting the idea to groups of jobbers and their salesmen, and the latter carrying it on to their trade. Presumably there will also be literature supporting the personal work of the staff.

The sales promotion idea met with the unanimous approval both of manufacturers and jobbers, who realized that sales of automotive equipment and consequently factory production were limited by lack of aggressive and intelligent merchandising in many dealer establishments. The jobbers frankly confessed also that they would like to have the educational work applied to their own selling organizations. They believed that the right sort of effort would not only make better merchants of dealers and garagemen already handling accessories but through exposition of the opportunity for profit would induce others in automotive merchandising and service lines to take up equipment selling.

The membership showed so much enthusiasm over the sales promotion plan that an additional $25,000 for the coming year was unofficially promised.

In connection with the proposed sales promotion work, the association went on record favoring payment by retailers of commissions on accessory sales over and above the regular salaries of employees making them.

It was tentatively decided to establish a permanent traffic bureau for the association with a full time staff. A traffic man is now giving part of his time to the work at Chicago headquarters and has already saved members considerable in trade overcharges. The bureau probably will be established at the annual meeting in November.

A code of fair trade practices, for the guidance of both manufacturers and jobbers, was adopted with 35 clauses.

The meeting was attended by delegates representing 133 manufacturers and 99 jobbers.

SCRIPTURAL SIGNS NEW DANGER MARKS

UNIONTOWN, PA., July 11—Instead of the usual danger signals at points in the mountains that require careful driving of motor cars, there now have been placed scriptural warnings. No one seems to know their source. The signs are wooden ones, 3 feet by 2. At the most dangerous curves on the national pike between here and Cumberland are warnings, "Prepare to Meet Thy God," and similar cheerful quotations from the Bible that have an appropriate bearing.

13,759 Buick Owners Receive Cars in June

DETROIT, July 11.—Buick Motor Co. delivered 13,759 cars into the hands of owners in June. Shipments last month were 3800 more than those of the entire first quarter and represented actual retail sales at the rate of 530 cars daily compared with peak plant capacity of 600 cars a day.

E. T. Strong, general sales manager, said that Buick figures for June disprove the assertions that the automotive industry is through with big figures. "They are evidence that the industry has earned the right to the title of one of America's greatest industries," he said, "and that the spirit of pessimism prevalent in some quarters did not faithfully represent the sentiment of the public.

Steel and Wage Cuts Bring Cheaper Cars

Cleveland Manufacturers Declare Some Did Not Get in on Low Prices

CLEVELAND, July 11—Cleveland automobile manufacturers as a rule say that it is too early yet to prophesy what results will follow the cut in prices of steel recently made by the United States Steel Corporation.

Some of the producers say they have been buying at the new market price of steel for the past two or three months, and that the public announcements of price reductions are but confirmation of prices of which they have had the benefit.

Manufacturers who buy their bodies expect a reduction in costs as do others who purchase parts and assemble cars. These manufacturers are getting in touch with concerns from which they buy, in an endeavor to ascertain just where they will stand in the near future in the matter of prices for parts.

Some Not So Lucky

Still another class of manufacturers has not been obtaining steel at the new prices. They say the result should lower costs as they have been purchasing above the new price levels.

One manufacturer pointed out that there is evidently some rivalry between the independents and the United States Steel Corp. The independents some months ago were quoting higher prices than the corporation, and as a result the plants of the latter were kept running with a larger output than were those of the former. Then the independents cut to a point below the corporation and now the latter has gone below the independents. The steel situation is likely to bring developments even more beneficial.

The cut in steel prices, coupled with a general reduction in wages of approximately 15 per cent in all local automobile plants since the first of the year, together with price reductions have tended to get the industry back to normal.

It was developed that local manufacturers who convert steel into their machines have been buying closely, and have been playing for price reductions, while practically all have been asking for the benefit of price reductions on material delivered on contracts made before the lowering of values. This is relied on to keep inventories down to near where they should be.

The Stearns Co. has made more cars this year than it did in the same period a year ago. The store room is empty

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Highway Prospects Brighter in Mexico

American Delegates Return With Optimism After Conference With President Obregon

SAN ANTONIO, TEXAS, July 11—Prospects are bright for the improvement of the proposed Mexican highway from Laredo, Texas, to Mexico City, the capital of the southern republic, as an international extension of the Meridian Highway across the United States. This optimism was brought to San Antonio by delegates of the Meridian association, who have just returned here after a promotion trip along the proposed route. Conferences with local and State officials were held at each of the larger Mexican cities, and at Mexico City the delegates were in conference with President Obregon and Señor Faustino Roel, present head of the Mexican Department of Communications and Public Works.

"We found the people of Mexico overcoming their difficulties with a smile," D. E. Colp, vice-president of the Meridian association and manager of the truck department of the Nash South Texas Motors Co. here, declared. "The country is fast returning to normal. The Government has five big road projects under construction and it expects to keep building until the Republic has a good system of highways. The Mexicans realize what the tourist business means to any country and they are correct in assuming this will be large if proper highways are built. President Obregon discussed the highway problem at length with us and told us that the Government was caring for many of its people by giving them work on the highways.

"All the road work in Mexico is being done by hand, no machinery being used. Nevertheless, the work is fine and costs only about one-fourth what it would in this country. The roads are being built 20 ft. in width, to carry all kinds of traffic."

Hold Official Conference

Conferences with the State governors, chambers of commerce and local business men were held at Monterey, Saltillo, San Luis Potosi, Queretaro and Mexico City. Agricultural organizations likewise were represented at the conference, and provisional officers of the Meridian Highway Association were elected after each conference. At Monterey, Señor Carlos Cantu was named president; Señor Antonio Lopez at Saltillo; E. B. Turnbull at San Luis Potosi, and Señor Lorenzo de Vicento at Queretaro.

At Mexico City, it was decided that a general conference of all the highway committees of the several states would be called within a few months, probably in September. Then, the Mexican organization could be so perfected that the active work of locating and improving the highway might be gotten under way.

The delegates were taken from Mexico City by automobile to Cuernavaca, in the State of Morales, over a recently completed highway some 45 miles in length. The State of Morales is famous for the revolutionary activities some years ago of Emiliano Zapata. The visitors, however, found conditions so peaceful that the hotels at Cuernavaca did not even have keys for their doors.

"Everywhere new business activities were manifested," a report of the trip declares. "Commercial enterprises were being reconstructed and a general feeling of peace and prosperity prevailed everywhere."

The delegation included all members of the Texas State Highway Commission, with officials representing the Meridian association, State organizations of Texas, Oklahoma, Kansas, Nebraska and the Dakotas. Accompanying Mr. Colp were G. A. MacNaughton, treasurer of the association, of San Marcos, Texas.

Letters and a committee also have been received by the association asking that a similar tour be arranged over an eastern route from Brownsville, Texas, through Tampico to the Mexican capital. Mr. Colp hopes to organize such a tour.

Daimler Firm Settles Dispute; Work to Resume

LONDON, June 22 (By Mail).—An official announcement was made last night in Coventry to the effect that the Daimler company's employees had decided to accept the company's proposed terms and that it is anticipated that production will be resumed very shortly.

The trouble which has resulted in the Daimler plant being practically closed down for several weeks arose from the fact that the Engineering Trades Union held out in refusing to allow the company's employees to accept the revised terms of payment which the majority of the staff had in a ballot voted in favor of accepting. The dispute has, therefore, not been between the company and its employees, but between the latter and their union officials. One of the latter in a statement last night said: "We have arrived at some arrangement with regard to future prices for work, and if the Daimler company have work the men will be employed, but we do not anticipate any large amount of employment in the near future." This rather indicates the truth of what has been suspected, namely, that the company has not been very concerned at the stoppage, owing to the fact that the falling off of sales would not have enabled them to keep in full swing at any event.

URGES FRENCH AIRPLANE FLEET

PARIS, June 21 (By Mail).—Deputy Paul Benazet has introduced a bill into the French Chamber of Deputies which proposes to establish a fleet of 1000 airplanes suitable for war, but which can be operated commercially and therefore at little cost to the Government. The author of the measure called attention to the large and extensive aviation personnel of the Government.

Spring Business Fair in Dominion

U. S. Consul, Reviewing Outlook, Says Improved Sales Assure Better Business

WASHINGTON, July 12—Pointing out that there has been a fair spring business for automobiles in the Canadian market, Consul Felix S. S. Johnson, Kingston, Canada, prepared a report with regard to the present outlook for the sale of automobiles in that country.

"Discussion of the automobile market is connected frequently with the buying power of the farmers," it is stated, "and in view of the heavy reductions of the prices received by farmers for their products it has been thought that the automobile market would naturally be curtailed. Prices are not yet back to the 1914 level, and that is not expected, unless the industry is prepared to suffer crippling losses. Reviewing the outlook for the automobile sales, it can be said that while it is proved the recent price reductions have been made to meet competition, it is equally true that this should have the effect of bringing the price of cars down to the reduced buying power of the country, which has naturally decreased very sharply during the last six to nine months.

"The industry has plainly entered the competitive area for the first time in its last three years. It is going to be a struggle to get business and the race is likely to go to the strongest. During the abnormal demand of 1919 and 1920 the automobile producing capacity of the country was vastly expanded both by additions to plants by old companies and through formation of many new companies. Some of the new companies are making their bow to the buying public at a time when competition may go to the length of forcing weak or high cost companies to do business at a loss. In fact, broadly speaking, the May price cuts have probably eliminated the great bulk of profit which was still left in the industry. These price cuts were not based on a scientific revision in accordance with lower steel, lumber, leather and parts. They were purely competitive and were designed to get business in a greatly curtailed selling market."

OPEN TRACTOR DEMONSTRATION

FARMINGDALE, L. I., July 12—A demonstration of farm power operating machinery was started to-day in this town by the Farm Implement and Farm Power Machinery Development Association, co-operating with the State Institute of Applied Agriculture. The demonstration will include plowing, cultivating, planting, harrowing, threshing, wood sawing, hauling and road grading. There will be about 25 tractors in operation varying in size from 1½ up to 45 hp. Several farmlight plants and water systems as well as a number of stationary engines will also be exhibited.

Rubber Plants Near Peak of Production

75,000 Tires Manufactured Daily at Akron As Normal Business Looms

AKRON, OHIO, July 11—A survey of the rubber industry in Akron shows that practically all companies have climbed back to a position averaging 75 per cent of peak production attained in April, 1920. Over 75,000 tires are being manufactured daily in the rubber metropolis and all companies report orders on their books, both from dealers and automobile manufacturers, to keep their factories running at present pace through July and August and possibly September.

Dealers' sales of tires are heavier than they were a year ago, tire manufacturers assert, while automobile manufacturers have sent in heavy original equipment tire specifications for July and August, and also have given notice that they anticipate equally as heavy orders in September.

Goodyear, the largest and the hardest hit of the Akron tire companies during the industrial depression, has been one of the first to stage a spectacular "comeback." Having liquidated its losses through refinancing involving $88,000,000, and through re-organization of the entire company, Goodyear has experienced a steady climb back to a position closely approaching normal, and with the addition of 3000 men during the past two weeks, now is operating on a basis of 86 per cent of peak production.

Goodyear's peak was 31,181 tires daily, obtained in April, 1920. To-day the Goodyear factories in Akron and Los Angeles are making a total of 26,700 casings daily and 30,500 tubes. The Akron factories are operating on a production ticket of 23,200 casings and 27,000 tubes daily, and are running on a basis of three eight-hour shifts daily, and six full days of operation a week, with approximately 11,000 men employed. The company reports dealers' sales steadily climbing, and far in excess of dealers' sales for the corresponding weeks of last year, and also reports that automobile manufacturers have placed heavy July and August orders for original equipment.

That the Goodyear factories will continue to operate on the present basis, and may possibly increase production within the next two months, is freely predicted by officials of the company.

How Business Increases

The Firestone Tire & Rubber Co. is operating on a basis of more than 70 per cent of peak production which was 28,000 tires a day, attained in April, 1920. Firestone has lengthened its two daily shifts to nine hours each and is operating on a production basis of 20,000 casings and 23,000 tubes daily.

The B. F. Goodrich Co. has not materially increased production within the past few weeks, continuing on a basis of about 15,000 casings and 16,000 tubes daily.

About Labor Turnover

Every Akron tire company reports a much higher degree of efficiency among factory operatives than a year ago when abnormal wages were paid tire builders and when Akron was in the throes of prosperity and wanton extravagance. Whereas the factories previously averaged about a tire a man per day, they are now showing more than a tire and a half per man in many departments, while the general average of increased efficiency, as reflected in production records, will exceed 40 per cent. Workmanship is better, factory managers report, and in re-employing men a higher grade of workmanship has been gained in general.

Labor turnover to-day is almost nil in Akron. A year ago when jobs were plentiful, when several Akron factories enforced a $6 daily minimum factory wage, and when every rubber company was calling for men, the labor turnover in some instances reached a mark in excess of 30 per cent. But to-day, manufacturers state, conditions are in sharp contrast, and labor turnover has been reduced until it has become negligible, through each factory operative's desire to hold onto his job as long as possible. The weeding process also employed in practically all factories, has conduced greater individual and collective efficiency. Rubber companies which have put on men in blocks of several hundred or a thousand, have picked them carefully from the many applicants, and at the same time have used many of them to replace careless workmen.

COSTS JAPANESE $10 TO OWN CAR ALL YEAR

PONTIAC, MICH., July 11—Two hundred Japanese are riding in one Oakland touring car which they each call their own, through a co-operative idea established by a Japanese company. The firm was organized with an initial capital of $150,000 and the first purchase was 55 Oakland touring cars. These have been sold to 11,000 Japanese under the plan by which the company operates.

Each stockholder pays $10 and in return receives a one year's interest in an Oakland touring car. The year has been divided into days and hours and a specific time allotted for each stock holder to take a ride. For instance, a man is notified that his time will be from, say, every Thursday from 11 o'clock to 3. The arrangement nets the firm $2,000 for each car sold and gives the Jap automobile enthusiasts the satisfaction of being a car owner for the very modest investment of $10.

Four Duesenbergs in Grand Prix Race

U. S. Will Be Represented for First Time in Fourteen Years in French Classic

INDIANAPOLIS, July 11—American interest in the French Grand Prix which will be run at Le Mans July 25 will be centered in the four Duesenberg cars which will face the starter. It is the first time in 14 years that an American entry has appeared in the European racing classic.

The Duesenberg entries have not been made by the company which manufactures the car but rather by Americans interested in racing who believe that the American machines can carry off the honors. The funds necessary to send the four Duesenbergs abroad were subscribed by Richard Kennerdell, chairman of the contest board of the American Automobile Association; Albert Champion, president of the Old Timers' Club; Barney Oldfield and others.

The drivers who will pilot the cars in the Grand Prix are thoroughly familiar with them and have previously driven them in races. Joe Boyer and his mechanic Erne Olson sailed for France early last month and Jimmie Murphy two weeks later. The other pilots will be Guyot and Inghibert, French veterans who are taking the Duesenberg against the best racing car drivers of Europe.

Among the cars and drivers entered are: Ballot, De Palma; Sunbeam, Rene Thomas; Talbot, Dario Resta; Ballot, Chassagne, and Sunbeam, Boillet.

The Grand Prix this year will be the first since 1914 because of the war and the first at Le Mans since 1906. It is a road race of 321 miles, 10 miles to a circuit over level dirt roads with many dangerous turns.

All the Ballot cars will be equipped with Goodyear tires.

Fiat Car Not to Start in Grand Prix Races

PARIS, June 29 (By Mail).—Fiat will not start in the French Grand Prix race at Le Mans on July 25. This decision has been taken by the leading Italian firm after having paid entry fees amounting to $7100, but without any explanation being given as to the reason for the withdrawal. The Grand Prix cars have been on the road for some time and new eight cylinder engines have been built and tested, it is declared, with good results.

TOOL FIRM GOING TO POLAND

ROCHESTER, N. Y., July 11.—Stockholders of the Rochester Auto & Tool Co., a $75,000 corporation here, owned principally by residents of Polish descent, have voted to remove the equipment of the plant to Jaslo, Poland. The plant has been in existence two years.

U. S. Gives Goodyear Aircraft Contract

Akron Plant Will Be Busy One Year Making Balloons and Dirigibles

AKRON, O., July 11—Regardless of the outcome of the present spirited controversy now current in congressional circles as to the comparative advantage of aircraft and heavily armored battleships as America's first line of defense, both the army and navy are to have more lighter-than-air ships, orders for three large dirigibles and 38 observation balloons having just been placed by the Government with the Goodyear Tire & Rubber Co. of Akron.

The Government orders just received will keep the Goodyear aeronautical factory, which is the largest in America, busy for the next year, officials state.

Two patrol and scouting airships of 180,000 cu. ft. gas capacity each, will be built for the navy and will be delivered early next spring. A dirigible of similar size but of a special Goodyear design, will be completed for the army in November. All three ships will be officially tested at the Goodyear-Akron air station at Wingfoot Lake.

The military airship for the army will embody many new features of design which will make it the most modern aircraft in either arm of the Government service. It will be the first dirigible in American to have its motors in the car instead of in separate power units. Two propellers will be driven by bevel gears at a two-to-one ratio with transmission placed on outriggers instead of the motors driving direct to the shaft. This will allow the engine to run while the propellers are idle by throwing out the clutches, and will permit the propellers to be reversed—a new feature to permit greater facility in landing. Either motor can drive both propellers in the event one motor develops trouble. With both motors inboard they can be overhauled in flight much easier than on the outriggers, as in the present type of dirigible.

The army ship will be 170 ft. long and 45 ft. in diameter. It will be powered by two 125 hp. Aeromarine motors operating at 1600 r.p.m. Owing to the special reduction gear the propellors can be held down to 800 r.p.m., giving greater efficiency at higher speeds. The ship will have a speed of 60 m.p.h. and a "ceiling" of 10,000 ft. The car will be entirely enclosed and will house a crew of six, although three men can operate the ship in peace-time. The ship will be used for border patrol. The navy ships will be used for scouting.

$826 MELBOURNE CYCLE PRICE

WASHINGTON, July 12.—The average price of a motor cycle in Melbourne, Australia, is $826, according to advice received by the Bureau of Foreign and Domestic Commerce. In 1911 it was $315, and in 1914, $365.

TRACTORS MAY TAKE PLACE OF CITY MULES

INDIANAPOLIS, July 11—The small tractor is assuming a new role in this city. The use of tractors is believed to be one method of getting the city out of a serious predicament. At the present time the board of sanitary engineers uses mules and horses in the ash and garbage collection departments. In casting about for a place to house all the animals the board found a suitable location in West Indianapolis, a part of the corporate city. Citizens of that section have protested to the point of beginning legal proceedings to dis-annex the entire section from the city, thus forestalling any municipal barns in the section. As a result the board is conducting a series of experiments with small tractors, which if successful probably will mean the elimination of every horse and mule from the department. Officials of the sanitary commission say the experiments so far have been satisfactory and it is likely that within 90 days the entire department will be motorized.

U. S. Trade Board Cites Rubber Firm to Court

WASHINGTON, July 11.—Upon application for the issuance of a complaint the Federal Trade Commission has cited the Diamond Holfast Rubber Co. of Atlanta, Ga., in complaint of unfair competition in the manufacture and sale of automobile accessories and repair materials in interstate commerce. It is alleged that this company marketed its products in such a way as to pass them off as those of the Diamond Rubber Co., a subsidiary of the Goodrich company.

Further allegations are made that the respondent has marketed its products in containers with labels which feature the word "Diamond" and so closely resemble the labels of its competitor, the Diamond Rubber Co., in typographical arrangement, color scheme and general appearance as to cause confusion in trade. Thirty days are allowed for the filing of an answer after which time the case comes for trial on its merits, Aug. 9.

The Federal Trade Commission dismissed its complaint of unfair competition against the Super Tread Tire Co., South Bend, Ind., for failure of proof. The complaint alleged that the respondent circulated advertisements imputing that its rebuilt tires were new.

RECORD SHIPMENTS FOR JORDAN

CLEVELAND, July 11.—In June the Jordan Motor Car Co. of Cleveland produced and shipped over 200 cars more than in any month in their history. May also was a peak month showing a 26 per cent production gain.

Tire Firms Cut Down Fabric Obligations

Goodyear and Firestone Progress Rapidly in Liquidations—Ease Contract Burdens

AKRON, July 12.—Considerable progress is being made by the larger tire companies in liquidating contracts for fabric which have been hanging fire for several months. Goodyear, which had contracts for 60,000,000 yd. of fabric, has taken delivery of approximately 10 per cent. Firestone is rapidly reducing its commitments and recently was compelled to refuse orders for certain grades of tires because they could not obtain sufficient fabric in time. Goodrich is taking delivery more slowly than the other large companies and does not expect to liquidate present contracts before 1922.

Various expedients have been adopted by tire companies to ease the burden of high priced fabric contracts inasmuch as there have been no cancellations. In some cases deliveries have been taken for from 25 per cent to 50 per cent of the contract at the original quotation and the remainder at the market price. Other companies are taking goods at the market price to be paid for on the usual terms and are giving long term notes on the difference due on high priced contracts. Some companies are understood to be buying cheap fabric in the open market to average costs.

Smaller tire companies which did not have large commitments either for crude rubber or fabric because they lacked the financial resources of the larger factories are in a much better position in regard to supplies and are taking advantage of the low prices on both these materials.

Injunction Halts Use of Overland for Tires

TOLEDO, July 11 — Willys-Overland Co. has been granted an injunction against the Akron-Overland Tire Co. restraining it from the use of the name Overland in its corporate title or in any use in connection with its product. The order was handed down in the United States Circuit Court of Appeals in Philadelphia.

The injunction is interpreted to give in effect to the creator of a trade name in an industry the sole right to use that trade name in connection with any article which is commonly accepted as an accessory to the product which originally bore the trade name.

PLAN RUBBER PRICE CONTROL

NEW YORK, July 12—A dispatch from London says the British Rubber Growers' Association has passed a resolution recommending producers to take immediate steps to reduce by 50 per cent the output of the association's membership. It is preparing a scheme for creating a selling organization with a view to control of prices.

President Assures Tax Law Revisions

Harding Allays Business Apprehension by Summoning Senate and House Leaders

WASHINGTON, July 11—Because of the apprehension existing among business men, President Harding has given assurances that the internal tax laws will be revised. Reports have been current for some time that Congress would continue its dilatory tactics until it would be necessary to reenact the tax laws without substantial change. Apparently, business men and industrial leaders had good grounds for this supposition. The President, however, knew that American business men would rise in righteous wrath in event the Administration's program for tax revision was side-tracked by the legislative branch of the Government. He is cognizant of the fact that many firms will be forced to the wall before the end of the calendar year, unless the inequities of the existing law can be removed. The Chief Executive has given serious consideration to the tax problem and, as a consequence, summoned Senate and House leaders for conferences as to the most expeditious way out of the difficulty.

The Senate has made one or two efforts to recess for the summer because of climatic conditions in Washington. At least, the climate is given as the excuse for a holiday, but the real reason is quite obvious — Congressional elections are scheduled for next fall and it is necessary to put their political machines into operation at an early date. The debate on the tariff bill closes July 21 in the House and then the House Committee on Ways and Means will take up the consideration of the revenue bill, for this measure must, under the law, originate in this committee. It is doubtful if there is one man in Congress who could safely predict the revision which the Senate and House will make in the tax laws. The Senate Committee on Finance will study the permanent tariff bill as passed by the House. It will not be held up in this committee because they have very definite ideas as to what they want in tariff legislation. It is quite certain that this committee will make many drastic changes in the House bill. The President has told the Congress to pass the tariff bill and revise the internal revenue laws without delay. He has suggested that lesser legislation should be pigeon-holed until the regular session.

Harding Wastes No Time

It now appears that the Administration has put the quietus on the plans of Congress for bonus legislation. The President wasted no time in making known his desires on the subject. He took the bit in his teeth, so to speak, and called personally at the Capitol for conferences with legislative leaders. He told them very quietly but firmly that the proposed enactment of the soldiers' compensation bill would be a rash move at this time and something which the Administration could not countenance in justice to the American taxpayer. Secretary of the Treasury Mellon stressed the fact that the bonus will cost the country $2,200,000,000 in addition to the four or five billion which is required annually to conduct the ordinary process of government. The program of economy in governmental expenditures, which the present Administration adopted and has given admirable proof of its intentions to carry out, would have been shattered. One of the encouraging features of the situation is the fact that the bonus bill is not strictly a party matter, for Democrats, as well as Republicans, agree with the President that bonus legislation should be postponed.

Chamber Opposes Bonus

The Chamber of Commerce of the United States is opposed to a bonus at this time. They state that the minimum amount that would be paid out by the Government under the proposed bonus bill exceeds the total annual cost of government for the fiscal years of 1915 and 1916. Secretary Mellon has said "I should be derelict in my duty to the country and to the veterans if I failed to give this warning of the inevitable financial consequences of the bill. This is not a time to impose several billion dollars of new liabilities on an already over-burdened treasury. It seems particularly inappropriate to give present consideration to the measure when we still have before us the pressing problem of revising the internal tax laws and finding sufficient revenue to meet the existing requirements of the Government. It would involve grave dangers of renewed inflation, increased commodity prices and unsettled business conditions."

Survey Shows Slight Drop in Employment

WASHINGTON, July 12.—Analysis of employment conditions after an industrial survey by the Federal Employment Service, shows a slight decrease in the number of workers employed in the automobile industry during June.

According to the Federal Employment Service "detailed examination of the present returns indicates clearly the fundamental causes of the protracted industrial depression and the mounting tide of unemployment.

"Continued unsatisfactory conditions of transportation," it says, "with freight rates in many instances considered almost prohibitive, lack of anything like a normal foreign market, the present low value of farm products, stagnation in iron and steel, high costs of construction and general dullness of the retail trade stand out prominently as leading factors in the situation.

"Industry generally is optimistic and while the likelihood of a dull summer in most lines is fully recognized, the tendency is to count on improvement."

Race Drivers Like Smaller Engines

Speed Kings Believe 122 Inch Maximum Will Mean Industry Development

INDIANAPOLIS, July 11 — Race drivers in Indianapolis are unanimously in favor of the new ruling of officials of the Indianapolis Motor Speedway to the effect that in 1923 cars entering for the 500 mile race will have to keep the piston displacement at 122 cubic inches as a maximum. The displacement in European cars would mean two litres. "Howdy" Wilcox stated to-day that it was his belief the action on the part of the Indianapolis race course officials would aid materially in developing the motor industry in this country. Louis Chevrolet, who designed two successive winners on the local course, also is in favor of the smaller displacement. Officials of the Duesenberg, while interested in the announcement, said that because they expected to retire from the racing game, they were not sufficiently interested to make any special experiments from a racing standpoint.

With the announcement of the reduction in displacement, Jean Chassagne, who was in the Ballot plant in France for some time and is said to be familiar with the creations contemplated and experiments tried, declares that before two years have passed the smaller engines will be making the speed the larger engines do. He said two two-litre cars now were being perfected in the Ballot and road trials prior to the Grand Prix in Le Mans showed them to make 95 miles. He believes that in another year the company will have perfected an engine that will compare in speed with those of larger displacements.

"Howdy" Wilcox is enthusiastic over the change. He said to-day that while the races might be uncertain the first year, yet some startling surprises would be recorded with the smaller engine. He like the others believed the second year would see the small engine on a par with the larger one. He is expecting a reduction of weights also. At the present time the minimum is about 1650 lbs. and he expects this to be reduced to about 1400 lbs. He says the small engine will produce as much speed eventually and the lighter car will enable the drivers to make some wonderful showings.

This is the fifth time that the Indianapolis track has reduced the engine sizes.

START PROBE TO SOLVE THEFTS

NEW YORK, July 11.—District Attorney Lewis of Kings County will soon start investigating alleged collusion between owners of automobiles insured against theft and the thieves who steal them. The movement has been precipitated by the statement of an alleged thief who said he had taken the car in question under agreement with the owner so that he might collect insurance.

Franklin Official Honored by Friends

John Wilkinson, Inventor of Air-Cooled Motor, Has 20th Anniversary at Syracuse

SYRACUSE, July 11 — John Wilkinson, vice-president and consulting engineer of the H. H. Franklin Manufacturing Co., inventor of the first valve-in-head, four cylinder, air-cooled motor in America, the product of whose genius has developed into the world-known and esteemed Franklin automobile, made in the largest industry in the city, was guest last night at a reception to commemorate the twentieth anniversary of his start in the business and presented with a beautiful silver loving cup.

It was an intimate affair, this gathering at the showrooms of the E. W. Lawton sales agency, unusual in a city that is never slow to acknowledge and pay tribute to genius of her native or adopted sons, marked by expressions of regard and esteem of Franklin car owners and citizens of Syracuse generally. Among the crowd that heard sung the praises of the inventor and listened to him as with characteristic modesty he bestowed equal credit on the vision of H. H. Franklin and Alexander T. Brown, both of whom were present, were co-executives, salesmen, mechanics from the plant, leaders in the business and professional life of the city.

Mayor Is a Speaker

Mayor Harry H. Farmer, William Allan Dyer, president of the Chamber of Commerce, and Frank H. Hiscock, chief judge of the Court of Appeals, were speakers introduced by S. Earle Ackerman, sales manager of the Franklin company, who paid tribute to the ingenuity of the inventor, his persistence in the face of obstacles, and praised him for the wonders he has wrought that have brought incalculable benefits to the city through creation of one of the great industries of the country.

Mayor Farmer represented the municipality officially. He referred to the wonderful advertising given Syracuse as the home of the Franklin car, greeted as a product of real merit in far off Japan, Alaska or the Antipodes and produced in a factory that has grown to be the largest of the many diversified industries here. He hoped Mr. Wilkinson would be spared in present vigor to participate in the celebration of the fiftieth anniversary which the mayor predicted as an even greater occasion than that of last night.

To Judge Hiscock was delegated the honor of speaking as the personal friend of Mr. Wilkinson, whom he has known since the flaxen-haired boyhood of the inventor to whom all paid tribute and has watched his career with a pride he made no effort to conceal in his remarks. John Wilkinson is one of those men who has been able to create something to make life happier and more comfortable for his fellowmen, at least to have made a blade of grass grow where nothing had grown before, if he had not strictly complied with the scriptural recipe for blessedness by making two grow where one grew previously.

Two inventors whose names are inseparably linked with Syracuse it was his privilege to know quite intimately, Judge Hiscock said. First was the late John E. Sweet, who was so constituted he would rather put out a first class engine and sell it for what it cost him than to strive for the material returns alone, and the other was Mr. Wilkinson.

Sketching briefly the latter's career and paying tribute to his genius, industry and perseverance, Judge Hiscock wove into his informal remarks many little personal touches that revealed Mr. Wilkinson in a new light to some of those who do not know him so well, and also paid tribute to the confidence of Mr. Franklin and Mr. Brown in his invention, and the wise management that has built up the great industry making one of the best motor cars in the country.

Reorganize Van Wheel; Make Extensive Plans

SYRACUSE, July 11.—The Van Wheel Corp. has been reorganized and is getting ready to go ahead in a much larger way. The new officers of the corporation consist of T. G. Meacham, president; J. W. Vanderveer, vice-president, and R. T. Wennstroom, treasurer and secretary. Meacham was formerly vice-president and general manager of the New Process Gear Corp. of Syracuse, now the New Process Gear Division of the Willys Corp. and is also president of the Meacham Gear Corp. Vanderveer is the inventor of the Van wheel and was also vice-president of the present company previous to the reorganization. Wennstroom was formerly comptroller of the H. H. Franklin Mfg. Co., and vice-president of the Walker Body Co. of Amesbury, Mass.

The corporation manufactures the "Van" hollow spoke cast metal wheel for both trucks and passenger cars. The truck wheel is of malleable iron, cast in four sections and electrically welded, which gives a true and concentric wheel.

RUBBER FIRM FILES ANSWER

CLEVELAND, July 11—The Columbia Tire & Rubber Co. of Mansfield has filed in the Federal Court here an answer to bankruptcy proceedings brought against it. All allegations are denied and a request is made for dismissal of the petition. The answer declares there is no merit to the claim of the Brighton Mills Co. for a large amount. Denial is made that the company is insolvent or that its funds were transferred to the Farmers Savings & Trust Co. It is asserted that only plant and equipment, not including quick assets amounting to nearly $500,000, were transferred. The company asserts that after deducting all indebtedness the net assets amount to nearly $1,000,000.

Cameron Takes Over Sandusky Tractor

Production of Engine Will Be Continued at Bridgeport Plant —Orders Are Steady

NEW YORK, July 11 — Cameron Motors Corp. has acquired the Dauch Mfg. Co., manufacturer of the Sandusky tractor at Sandusky, Ohio, and will continue the tractor business alone for the present, later adding production of the Cameron car. The plant containing 100,000 ft. of manufacturing space was said by President Cameron to be ample for the proposed needs of the company.

The tractor will be a light farm tractor similar to the one now turned out and the trade name Sandusky will be continued. The new product, however, will be equipped with a Cameron 4-cylinder air cooled engine and will sell at about $425. These will be distributed through the dealer organization built up by the Dauch company, which numbers about 300 members.

Production of the Cameron engine will be continued at the Bridgeport plant of the Liberty Mfg. Co. under contract with the Cameron company. The rest of the tractor will be assembled at Sandusky. There will be no changes in the factory organization until complete plans are worked out covering production and sales.

Decision to manufacture the tractor only, for the present, was said by Cameron officials to be due to the unusual demand for this machine at this time. There are ample orders ahead and production will be speeded up to keep abreast of sales, but it is not expected to get into full production for at least a year.

French Aviation Firms Are Now Consolidated

PARIS, June 25 (By Mail).—Three of the biggest French aviation companies: Astra, Nieuport and the Compagnie Generale Transaerienne have united their forces, with a capital of $5,600,000, nominal exchange. The present offices and factory of the Nieuport company will constitute the headquarters of the new group, of which the general manager will be Marcel Thomas, at present with the Astra company, and chief engineer M. Delage, of the Nieuport company. The new group will be interested in both airplanes and airships, and has in hand an order for two hundred planes for the Japanese Government.

PREST-O-LITE OFFICIAL DIES

INDIANAPOLIS, July 12—Announcement has been made of the death of Lewis N. Miller, 27 years old. assistant purchasing agent for the Prest-O-Lite Co., which occurred yesterday after an illness of several weeks. Mr. Miller served in the quartermaster corps of the United States Army.

June Shipments Beat April or May

Second Quarter 60% Same Period of 1920

Report to N. A. C. C. Shows Surprising Production Record by Industry

NEW YORK, July 13—Shipments of automobiles for the month of June, as reported by the National Automobile Chamber of Commerce were 8 per cent larger than for May and virtually the same as in April. They reached 60 per cent of the mark set in June, 1920.

Carload shipments in June approximated 19,200, there were 18,000 driveaways and 3700 machines were shipped by boat.

Figuring boat shipments and driveaways in carload equivalents, shipments for the second quarter of this year nearly doubled the first quarter and were 61 per cent of the second quarter of 1920. Shipments for the second quarter of last year, excluding Ford, were 311,505. Shipments for the same period this year, therefore, were 190,018.

The figures since Jan. 1 by months compared with the same months of 1920 are:

	Carloads		Driveaways		Boats	
	1920	1921	1920	1921	1920	1921
January	25,057	6,485	29,283	3,185	....	93
February	25,505	9,986	43,719	7,507	....	99
March	29,326	16,287	57,273	9,939	....	75
April	17,147	20,187	64,634	14,197	....	1619
May	21,977	18,608	74,286	15,193	....	2381
June	22,516	19,200*	60,746	18,000*	8350	3700*

*Partly estimated.

These official figures demonstrate conclusively that the automotive industry is running on a better basis than almost any other in the field of manufactures. It proves also that the pessimism which prevails in many quarters is not well founded.

Steel and Wage Cuts Bring Cheaper Cars

(*Continued from page* 87)

to-day. This means that the company has found a ready market for its products. George W. Bocker, president, says that June was an excellent month, with the factory running at capacity. He expects a satisfactory volume of business in the next six months. July has started off satisfactorily, with the factory operating at capacity.

Alexander Winton, whose keen intellect and executive capacity coupled with engineering skill, built up the Winton plant and established a reputation for the establishment, is devoting more time to production, with results that are satisfactory. Production in June was the greatest in any month of the year, and July promises to be about as good as June. The company plans to manufacture more cars in the next six months than it did in the first half of the year.

Jordan produced 30 cars a day in June and the schedule for the present month is about the same. M. S. Jordan, president, and Paul Zens, secretary of the company, left for Detroit Monday, July 11, for a conference with concerns from which they purchase parts and bodies. The reduction in the price of steel caused them to go to ascertain what benefits they may obtain from it.

At the Chandler and Peerless plants statements were made that factory operations were satisfactory, and business was good.

Coast Sales Figures Prove Big Recovery

SAN FRANCISCO, July 12—The rapid recovery of the automotive industry on the Pacific Coast, and the steady return to normal were well illustrated at the end of June by figures issued by the State Motor Vehicle Department. These figures cover the entire State, but San Francisco dealers also declare that approximately the same proportion of increase holds good for Nevada and Arizona and for export trade as well, though not quite so strongly for sales in the states of Washington and Oregon.

The figures given out for the first four months of 1921, with comparisons for the same period of 1920, are as follows:

	1920	1921
Automobiles	421,982	540,339
Trucks	29,326	30,757
Trailers	1,699	2,456
Motorcycles	16,243	14,427

Conditions in the automotive industry in the East Bay section—Alameda, Oakland, Emeryville and Berkeley—are reported good by Manager Wert of the Oakland office of R. G. Dun & Co., in his summary for the closing week in June.

"Market conditions affecting retail sales of automobiles have fluctuated considerably in the past month. Some cars have had an unusual sale, while others have been slow. At present, sales are a little more active, due to recent price reductions. As a whole, conditions in the retail automobile field are quite satisfactory, and all the dealers seem to hold an optimistic air."

Some of the individual statements of sales and conditions, made in good faith by the dealers, show that Wert is too conservative.

Cleveland Reaping Price Cut Harvests

July Sales Get Start Well Ahead of Average of Several Years

CLEVELAND, July 11 — Price reductions will make July this year a good month for the local retailer of automobiles, according to statements made by several dealers, who were visited at the close of the week July 9.

The first week of July started off with sales well ahead of the July average for several years. July long has been regarded as the first month of declining sales, but this year every dealer visited noted a stimulation of sales.

They accounted for this with the statement that price reductions are responsible. Many have been holding off buying new cars, waiting for price reductions. They have been encouraged to hold off by slight cuts here and there, but now that practically every car sold in Cleveland has been reduced in price and cuts have been very substantial, the buyer has become convinced that he will not profit by further delay. With the vacation days ahead and some of the best days for driving cars coming the car lover has come into the market with a rush.

"People are just beginning to realize that their dollar now will buy a hundred cents on the dollar of value in motor cars," said F. E. Stuyvesant, Hudson and Essex distributor. "This is true when judged by pre-war price standards."

The Barnes Motor Co., which has the Dodge agency, noticed no let-up in the demand for cars during the first week of July. The Chevrolet agency had a similar report to make with reference to the first week of July. New cars are moving easily, while used cars are harder to dispose of at this agency.

The Auburn agency will set a new record for July unless there is a complete upset in the outlook established by sales in the first week of the present month.

The Buick agency did as good business the first six days of this month as it did the first week of June. So did the Oakland, Overland, Willys-Knight, the Jordan, Peerless, Stearns, Templar and Franklin agencies.

STOCKHOLDERS ORGANIZE

FORT WAYNE, IND., July 12—A. L. Jones, real estate dealer, has been named as president of the Revere Corp., a company organized among the stockholders of the Revere Motor Car Corp., of Logansport, for the purpose of purchasing the property of the defunct concern.

South Africa Happy Over Sales Outlook

Peace Treaty Progress Important Factor—Tractor Sales Promise New Records

JOHANNESBURG, SOUTH AFRICA, June 10 (By Mail)—The prospects for a good winter and the news that the matter of the Peace Treaty in Europe had become more settled has made country business very much brighter. Salesmen are all bringing in more optimistic reports, and better still, good sales records. The prospects for the second half of 1921 are very bright and distributers are looking forward to the gradual return to normal—normal in the sense that sales have been slack in the country districts. City conditions have not undergone much alteration and the steady demand remarked last month still continues.

Competitions and runs to stimulate interest in automobiles are being continually held in the different provinces and there is no doubt that they are having an effect. The reduction in the price of gasoline has been welcomed by dealers and the supply is now able to cope with the demand. The portion of South Africa that has felt the depression least is Rhodesia and conditions there have been fairly good. At present that country shows signs of being able to absorb large numbers of cars, and in proportion to the population is well supplied. As this territory is opened up the field for cars and trucks there will be very large.

Talk Better Roads

The automobile is becoming more recognized as the future means of transportation in this country and although prejudices against it are dying hard the internal combustion engine is gradually coming into prominence. The question of better roads—in consequence of more modern methods of transportation being adopted—is receiving the attention it deserves and the press has taken up a firm attitude on the point. In view of the estimates passed by the Provincial Council of the Transvaal cutting down expenditure on highways, the matter is being pressed more strongly and the general opinion is in favor of modern methods of road construction and maintenance.

The year 1921 is going to be the tractor year for this country and associations for the promotion of tractor sales have been formed in the large centers with results that are very gratifying. Trucks are being used for logging work in Natal and Cape Province over bad roads, and the results given are satisfactory. Figures showing the relative efficiency of ox traction as against the truck have been published in the daily press, and the mechanical vehicle scores heavily.

Great uneasiness is being felt by the motor trade in connection with taxation proposals. Up to the time of writing nothing definite has materialized.

JULY SALES HEAVY IN WESTERN CITIES

NEW YORK, July 14 — Dispatches received to-day by AUTOMOTIVE INDUSTRIES from correspondents in Salt Lake City, Des Moines, Denver and Dallas state without exception that automobile sales in the territories of which these cities are centers have shown an increase for the first two weeks of July over the corresponding period in June. The increase was particularly marked in the Des Moines territory.

Normal July Business in New York District

NEW YORK, July 14.—Passenger car sales, which ran high throughout June in the Metropolitan territory, have dropped considerably during July up to date and the majority of dealers expect the falling off for the month to be more or less comparative with that which prevailed in normal years before the war.

Oldsmobile, Scripps-Booth and one or two other cars which had price reductions late in June after the novelty of most of the competing reductions had worn off sold better during the first two weeks in July than in previous months. However the normal run of cars, including the strongest sellers, have showed considerable dropping off in day by day sales.

The indications are that the July sales record will be considerably below June but nothing subnormal as July goes in New York city with a great many people in the automobile owning class out of town on vacations.

Notable sales records were made during June. Dodge sold at retail within the limits of New York city more than 400 passenger cars and 100 trucks. It is said that this has not been equalled except in cases where distributors included sales in outlying territories in their New York reports.

Nothing has developed to indicate that there will be any severe curtailment of buying during July and August. Dealers generally expect business to be slow but in this respect they will just be going back to normal conditions prevailing before the rush for cars in the past two years.

WINFIELD LAND PRICE LOW

PHILADELPHIA, July 13. — Judge Thompson in United States District Court here has set aside the sale of the Winfield Barnes Co. real estate holdings, consisting of a lot at Erie Avenue and Twentieth Street, 240x340 ft., and five buildings, which were bought at auction Monday by Morris & Kirby, attorneys for an unrevealed client, for $73,500. The court ruled the sum to be inadequate. The sale at auction of personal property of the company including valuable machinery and equipment in 742 parcels to many purchasers was affirmed.

Ohio Sales Improve as Car Prices Drop

Buying Starts Anew in Columbus Territory—See Continued Good Business

COLUMBUS, July 12—There is quite a noticeable increase in sales with the passenger car dealers of Columbus and central Ohio since the price readjustments have taken place. Apparently the public was waiting for the reductions in price and with the announcements late in May and early in June, buying which had been held up for some time was started anew. As a result nearly all of the local agents and jobbers have been having a much better volume of business with prospects for the remainder of the summer extremely good.

It is the consensus that things will gradually improve in this section. The unemployment situation is not as bad as formerly and more of the factories are in operation. In some cases the output of manufacturing establishments has been increased and the financial as well as the business depression is being relieved to a certain degree.

The worst feature of the trade is the slowness still shown in the farming communities. Farmers are not having a good season as far as the wheat crop is concerned, which together with low prices is curtailing their purchasing power. This is shown in the less number of orders received for automobiles, principally passenger cars. The truck business in farming communities has suffered from the same cause.

Truck dealers are still having a slow business and little improvement is expected for the time being. Mercantile establishments are not disposed to increase their business equipment under existing conditions and consequently they are playing a waiting game as far as the purchase of trucks is concerned. Commission men and wholesale grocers are probably the best prospects at this time, and some trucks are being absorbed in those lines of industry. Haulage firms have sufficient equipment when the shrinkage in business is considered and they are not in the market to any extent. With the revival of business which is confidently expected in the fall a better demand for trucks is anticipated.

The repair business at the various shops and service stations in the Buckeye Capital is fairly good. Owners are coming in with their cars for minor repairs but generally they are postponing the general overhauling. Parts business is quite good, according to local agents.

CANADA SHOWS IMPROVEMENT

OTTAWA, ONT., July 11—During the fiscal year ending June 30, 1921, Canada exported vehicles, motor cars and parts to the value of $2,591,995 to Australia, against $2,119,955 for the previous 12 months.

Verlinden Is Sued by General Motors

Former Olds President Alleged to Have Loaned Self $490,000 Without Consent

DETROIT, July 11—Suit was filed in Federal Court here to-day by the General Motors Corp. against Edward Verlinden, former president of the Olds Motor Works, to recover $490,000 alleged to have been loaned to himself from Oldsmobile funds on deposit in Lansing, without the knowledge or consent of General Motors officials. Refusal of Verlinden to return the money upon demand of General Motors officials when the loan was discovered resulted in Verlinden's immediate dismissal, according to the petition filed in court.

The petition says Verlinden was employed as general manager of the Oldsmobile division under the usual written manager's contract providing for a salary plus a bonus on net earnings of the Olds division. The General Motors Corp. portion of the annual bonus was payable in stock of the parent corporation and held for a period of years in the custody of corporation in accordance with a written uniform plan. It is alleged Verlinden disputed deductions for depreciation in inventories and plants made by corporation accountants in order to reduce them to the market value, and also demanded, the petition says, that bonus shares of stock being held for him be delivered to him immediately although under corporation plan dividends during the period of retention of stock are paid to managers and employees whenever declared to other stockholders.

Attorneys Issue Writs

Writs of garnishment against any and all funds to the credit of Verlinden in any Lansing bank were issued at the request of attorneys Stevenson, Carpenter and Butzel for General Motors. The suit resulted, it is alleged, from the action of Verlinden as assistant treasurer in countersigning a check on April 20. The check was drawn by Olds Motor Works division and payable to him against funds of the company in the City National Bank at Lansing for amount sued for. The check is said to have borne the notation "loan to Edward Verlinden." The petition recites denial of the plaintiff that it had knowledge of or authorized Verlinden to loan himself money for any such purpose or any other purpose.

Counsel Justifies Verlinden's Loan

DETROIT, July 11 — The action of Edward Verlinden, former manager of the Olds Motor Works and vice-president of General Motors Corp., in drawing a check against the Olds account for $490,000, is justified by E. C. Shields, attorney for Verlinden, as accruing to Verlinden under the interpretation of his contract existing before the du Pont interests acquired control of General Motors.

In a statement covering the steps which led to the suit against Verlinden, in which the corporation asks restitution of the money, Shields declares there is a discrepancy of more than $61,000,000 between the statement of 1920 earnings issued to stockholders, and the statement upon which President Pierre S. du Pont asked the Olds manager to adjust his contract bonus.

Owing to the unusual growth of the Olds division under Verlinden's management, the statement says, the manager was given a special contract under which he received a percentage of the earnings of the whole corporation. This contract was in force in 1918 and 1919 while W. C. Durant was General Motors head. During those years Verlinden's compensation under the contract was based upon net earnings without any special offsets, and he drew the amount from the Olds Motor Works account as he did in 1920.

Profits Are Shown

At the end of 1920, however, the statement declares, President du Pont informed him that the profits of the corporation after deducting several charge-offs and write-downs, was $32,000,000. At about the same time, the statement claims, the annual statement of the corporation for the year 1920 was issued showing net profits of $93,150,308.

Part of a letter from President du Pont to Verlinden is quoted in the statement in which the executive says that, "it is possible that the profits of the several divisions of the corporation used as a basis for computing your compensation may appear out of line with the spirit of your compensation contract." Following receipt of this letter and several conferences in which he objected to the du Pont interpretation of his contract, Verlinden drew the adjustment check.

The statement says the manager immediately informed President du Pont of his check and advised him that he would pay the corporation as soon as the stock should be delivered to him. He contends that it was part of his contract that the stock of the General Motors Corp. that was held by the company in his name would be delivered to him whenever he or the company should sever connection with it. This stock, the statement asserts, has not been delivered to him.

Concluding, the statement says: "The whole controversy arose over special write-offs and write-downs which Mr. Verlinden claimed were not justified under the terms of his contract, and which Mr. du Pont persisted in making."

OLD TIMERS GET NEW EMBLEMS

DETROIT, July 12.—Membership buttons in the Old Timers' Club are now being issued to accepted members by F. Ed. Spooner, secretary.

Look Only for Minor Revisions of Taxes

No Grounds for Assuming U. S. Treasurer Will Alter Original Recommendations

WASHINGTON, July 12 — It is believed that the Treasury's program for tax revision will contain only a few minor changes due to the movement of economic forces since Secretary of Treasury Mellon submitted his original recommendations to Congress last spring. There is no ground for assuming that the Treasury will recede from its previous declarations regarding the automobile industry. Just now the Advisory Board of the Treasury Department is comparing the fiscal needs of the Government with the estimated yield from the proposed tariff schedule and proposed tax rates.

The House Committee on Ways and Means will undertake the study of tax revision about August 1, when it is expected that the tariff bill will be sent to the Senate. The Senate Finance Committee conducted hearings on the internal revenue legislation for several weeks last spring under an arrangement with the House Committee on Ways and Means, in order to expedite the passage of the revenue law. Because of this action, the Senate Committee will be in a position to dispose of the House tax bill without long hearings and the whole measure should be enacted before September 15, provided the Congress quits bickering over various items.

While the Treasury has made no public announcement of its plan, it is known that Secretary Mellon is dependent upon the advice of Professor P. S. Adams, Chairman of the Tax Advisory Board of the Treasury. Prof. Adams is known to favor the replacement of the excess-profits tax by a tax on the undistributed profits of corporations; the repeal of existing sales or consumption taxes on fountain drinks, "luxuries" and medicinal articles, and the introduction or increase of a few miscellaneous taxes, chiefly on articles of widespread but not absolutely essential consumption, selected largely on ground of administrative convenience.

Ford Cuts Inventory $33,000,000 in Year

BOSTON, July 11—The Ford Motor Co., Inc., under the laws of Delaware, has filed with the Commission of Corporations of Massachusetts the following statement, dated April 30, 1921:

	1921	1920
Real estate	$71,329,719	$85 549,727
Machinery	46,459,046	41,661,137
Merchandise	63,848,157	96,859,012
Cash & acct. receiv.	86,995,166	62,499,027
Securities	10,361,963	18,921,608
Accounts payable	44,993,755	15,958,116
Notes payable	3,892,386	35,112,974
Surplus	182,877,686	165,679,132

White Celebrates 20th Anniversary

Branch Managers Dine Brothers and Recall Early Days of Industry

CLEVELAND, July 11 — Windsor T. White, chairman of the executive board, and Walter C. White, president of the White Co., were given a dinner to-night by the branch managers met in annual conference and to celebrate the twentieth anniversary of the White brothers in the manufacture of motor vehicles. All of the branch managers of the United States and Canada together with a few invited guests were present.

During the dinner J. S. Hathaway, manager of the Boston branch, and who in years of service is the dean of the branch managers, having been connected with the sale of White vehicles since the company started, presented the brothers, on behalf of the branch managers, with a miniature of the first White steam Stanhope built 20 years ago. It is a complete miniature made one-fifth size, and having every detail worked out with the exception of the internals of the power system. Fred S. Bonton of Cleveland, who purchased the first steam car built by the Whites on April 27, 1901, was among the guests and told of early experiences.

Colonel Clifton Speaks

Col. Charles Clifton, president of the National Automobile Chamber of Commerce and whose connection with the Pierce-Arrow Co. dates back 20 years, told of his close friendship with Windsor T. White from the days of the now famous New York-Pittsburgh Mudlark Tour in the fall of 1903. Colonel Clifton was the only representative of the manufacturing industry present.

George Urquhart, manager of the White San Francisco branch, who presided as toastmaster, in introducing Hathaway suggested some early reminiscences which resulted in an intimate sidelight on business ethics as expressed by Windsor White to Hathaway 20 years ago. He emphasized as a cardinal principle, "We can stand for an honest failure but cannot stand for a dishonest success."

Windsor White in his family talk to the group added interest by drawing attention to two old employees whose years of service date to the early days of the late Thomas White, organizer of the White Sewing Machine Co. One of these employees has been in the White service for 43 years, and the other for 40 years. They have already served under three generations of the Whites. Length of service does not all go to the employees, as the average years of association of the branch managers present with the company was 12 out of a possible 20 years of representation.

Roland H. White, president of the Cleveland Tractor Co., and the third of the brothers, who withdrew from the White company at its reorganization and started tractor development, was one of the guests. David Beecroft, president of the Society of Automotive Engineers, and directing editor of the Class Journal Co., spoke on some future aspects of the industry.

Jacoby Named Head of Mitchell Motors

NEW YORK, July 13—William L. Jacoby, an efficiency engineer and industrial expert for A. G. Becker & Co. for the past ten years, has been elected president of the Mitchell Motors Co., Inc., Racine, Wis. He succeeds D. C. Durland who has returned to the General Electric Co. with headquarters in Chicago. Durland remains a director of the Mitchell company.

Mitchell Motors is controlled by Becker & Co. and Ladenberg, Thalman & Co., of this city. Jacoby was placed in charge of the company's affairs because of his ability as an industrial executive. He has directed in the past many of the industrial enterprises in which Becker & Co. have acquired an interest. His home is in Chicago.

The retirement of Durland is understood to have been voluntary and the position he has taken with the General Electric is considerably more important than the one he relinquished.

The Racine company is coming back rapidly and its sales for June were the heaviest for any month in nearly two years. Sales for the first ten days of July went ahead of the June record for that period. The outlook for the company is decidedly encouraging. Its inventory has been reduced to normal proportions and material reductions have been made in its obligations.

DISBROW NOW A MANUFACTURER

CHICAGO, July 13 — Louis Disbrow, racing veteran, has entered the field of spark plug manufacture. He is vice-president and engineer of the Victory Co., of Milwaukee, making a plug in standard sizes and with metric extensions, and will make his headquarters at 2118 Michigan Avenue, this city, where sales headquarters will be maintained. He is also representing the Dow Chemical Co.'s line of pistons and hose clamps.

WHOLESALE GAS PRICES DROP

NEW YORK, July 12 — Wholesale prices on gasoline have now decreased about 28 per cent since Jan. 1, the price in 30 principal cities averaging to-day 21.1 cents a gallon. The lowest quotation is 15 cents a gallon at Kansas City, Mo., and the highest 26 cents at Seattle. Prices have declined only 2 cents a gallon in California and Washington since Jan. 1.

The New York wholesale price to-day is 24 cents, a drop of 7 cents since Jan. 1. In San Francisco the price is 25 cents, a 2 cent drop. Chicago is selling at 18 cents, New Orleans at 19.5, a 9 cent drop in each case.

Creditors Favorable to Denby Bond Issue

Certain More Than 75 Per Cent Will Agree to Plan for Working Capital

DETROIT, July 13—Creditors of the Denby Motor Truck Co. at a meeting yesterday showed an inclination to join whole-heartedly in the plan of the creditors' committee to issue bonds and first preferred stock in settlement of claims and for raising the necessary capital.

Twenty-five per cent of the merchandise creditors signed up at the meeting and those not present are sending in signed agreements by mail assuring favorable action by 75 per cent, according to members of the committee, which permits the plan to become operative.

The plan of the committee is to issue 100,000 class A first mortgage bonds to be used in the discretion of the directors for imperative current needs as working capital; 200,000 class B first mortgage bonds to be prorated among creditors, which is equal to about 25 per cent of the total indebtedness, and first preferred stock in an amount sufficient to cover the remainder of all claims, this stock to have priority over all existing stock, both preferred and common. The present preferred stock, of which there is $228,100 outstanding, would become second preferred. There also is outstanding $474,930 common.

Seventy per cent of the present stockholders have deposited the holdings with the Security Trust Company to be voted favorably on the committee plan which will become operative automatically when 75 per cent of the stockholders' and creditors' claims have agreed.

Durant Men in New York Will Discuss Policies

NEW YORK, July 11—Chiefs of the various divisions of Durant Motors are here this week for conferences with Durant on questions of general policy. Among those in New York for the meeting are T. W. Warner, Edward Verlinden, who will have charge of the main Durant plant at Lansing, and D. A. Burke, who developed the Sheridan.

Rapid progress is being made in building up a dealer organization, particularly in the East, where the work is under the direction of M. D. Leahey. Dealer relations are being established in the central territory by Verlinden and on the West coast by E. M. Steves, general sales manager for Durant Motors of California.

JENKINS SUCCEEDS HAMPTON

NEW YORK, July 13 — Uncertainty concerning the successor to E. H. Hampton as manager of the assembly plant of the Ford Motor Co. at Buenos Aires, Argentina, is cleared up by an announcement of the company that H. S. Jenkins is in charge of the Argentina branch.

NEW CAR PRICES

APPERSON REDUCES CARS

KOKOMO, IND., July 12—Reductions ranging from $250 to $750 have been made by the Apperson Bros. Automobile Co. on open cars in both its Standard and Anniversary models. The Standard 4-passenger is cut from $3,500 to $3,000, and the 7-passenger from $3,500 to $3,250. The Anniversary 4-passenger is reduced from $4,250 to $3,500, and the 7-passenger from $4,250 to $3,750.

ELCAR PRICES COME DOWN

ELKHART, IND., July 11 — Elkhart Carriage & Motor Car Co. has reduced prices on all models of Elcar in announcing its 1922 line. In the open cars the De Luxe models are reduced from $1,700 to $1,595, the Standard models are priced at $1,385, and the lighter models are reduced from $1,300 to $1,195. In the enclosed cars the 3-passenger coupé is reduced from $2,500 to $2,395 and the sedan from $2,600 to $2,495.

ALL HOLMES MODELS CUT

CANTON, OHIO, July 11.—Holmes Motor Car Co. has reduced prices on all models $400. The four and seven-passenger models are reduced from $3350 to $2950, the coupe from $4250 to $3850, and the sedan from $4550 to $4150.

KLINE CUTS OPEN CARS

RICHMOND, IND., July 11—Prices on Kline open models have been reduced $200 by the Kline Kar Corp., the new prices on the roadster and touring models being $2,090. The enclosed car prices are continued as formerly.

HAWKEYE TRUCKS REDUCED

SIOUX CITY, IOWA, July 11.—Prices on Hawkeye trucks have been reduced from $265 to $645. The 1½ ton is cut from $2365 to $1850, the 2-ton, $2915 to $2650, and 3½-ton, $4345 to $3700. Under the new management plans as inaugurated two months ago, the company reports a gradual increase in business.

CUT PRICES ON KLAXON HORNS

NEWARK, N. J., July 11.—Prices on Klaxon horns have been reduced on all models, the price change ranging from 75 cents to $3. In the future push buttons and wires will be furnished only with the Klaxon 20. With models 6, 6-Deck, 6-MC and 5 this equipment will cost 75 cents list, and with models 12 L and 12 S, will cost $1 list.

PORTAGE FILES ACCOUNTS

AKRON, OHIO, July 11.—Schedules in bankruptcy showing liabilities of $5,438,993 and assets of $5,074,337 have been filed in the United States district court at Cleveland by the Portage Rubber Co. of Akron, the papers being signed by M. S. Long, president. The company was thrown into the hands of receivers May 31, George D. Bates and John W. Maguire being named receivers. Maguire is vice-president and general manager of the company.

Notes and bills amounting to $3,444,320 constitute the largest items in the liabilities listed. Unsecured claims totaling $1,743,353 are also listed. Among the company's assets are listed real estate at $660,994, stock in trade $834,384, and machinery and tools $1,889,880.

Leland Denies Lincoln Refinancing Reports

DETROIT, July 11 — W. C. Leland, president of the Lincoln Motor Co., made the following statement to-day in reference to persistent reports of a reorganization and refinancing of the company:

"Our factory was closed last week for inventory and reopened this morning as it was announced it would do when we shut down. There is absolutely no truth in reports of any reorganization of this company or any change whatever in management. Any report that there is a big refinancing plan under negotiation also is absolutely false."

Sixty per cent of the normal force will be at work, he said, and about seventeen cars will be built daily.

HARVESTER TRACTORS DOWN

CHICAGO, July 12 — International Harvester Co. to-day reduced prices on three of its tractor models. Titan 10-20 is cut from $1,000 to $900, International 8-16 $1,000 to $900, and International 15-30 from $1,950 to $1,750. Each of these models is equipped with friction clutch pulley and angle lugs. The new prices are effective at once. In the case of the International models the price is the lowest ever quoted. With the equipment now included on the Titan the price too is lower than ever before. In announcing the new prices the company declares that all war time advances are wiped out and the products placed at a more favorable price than ever before.

DUESENBERG ELECTS OFFICERS

INDIANAPOLIS, July 13—Reorganization of the Duesenberg Automobile & Motor Co., Inc., has been completed by the election of the following officers: President, B. A. Worthington; vice-president and general manager, L. M. Rankin; secretary and treasurer, F. A. Reilly; chief engineer, F. S. Duesenberg; assistant chief engineer, A. S. Duesenberg; assistant engineer, E. J. Porter; sales manager, Harry W. Anderson; purchasing agent, George H. Beilstein.

CORBITT TRUCK REDUCED

HENDERSON, N. C., July 11—Corbitt Motor Truck Co. has reduced prices on all models from $200 to $500. Reductions on the 1-ton are from $2,400 to $2,200, the 1½-ton, $2,800 to $2,600; the 2-ton, $3,500 to $3,150; the 2½-ton, $3,650 to $3,300; 3½-ton, $4,500 to $4,100, and 5-ton, $5,500 to $5,000.

METAL MARKETS

MATURE reflection of the situation brought about in the steel market as the result of the downward revision in "official" prices can not help but convince the automotive purchasing agent that henceforth steel values will sail a more even course. It was only natural that announcement of the price changes should be followed by the question when the next cut in prices will eventuate, this on the ground that steel price levels are still 50 per cent higher than they were before the war. Leaders in the steel industry took particular pains to anticipate this question by accompanying announcement of the price changes with a showing that, eliminating the compulsory increment of prices as the result of the advance in freight rates and wage scales over those of 1913, steel prices now rule lower than they did before the war. This is only another way of saying that further reduction in prices must wait upon a lowering of freight costs and wage scales.

At the present there is no representative demand for steel. Hand-to-mouth buying is looked for to continue for some time, except perhaps by the railroads which are now expected to lead the way in committing themselves as buyers by contracts, once the financial arrangements with the Treasury, now under way, are completed. When, however, a sufficiently large demand develops from sources other than the railroads to warrant the placing of contracts for deferred deliveries, buyers will naturally bethink themselves of contracts that will protect them in the event that reductions in freight rates and wage scales will make further shading of prices possible. Good, although perhaps slow progress is being made in the matter of deflating wage scales. Of special interest to the automotive industry in this connection is the 10 per cent cut in wage scales assented to by the Amalgamated Association of Iron, Sheet and Tin Workers at its conference with the Western Sheet and Tin Manufacturers' Association in Columbus. For the time being the smaller interests among the "Independents" will endeavor to secure what business offers at the "stabilized" prices announced by the larger interests. It is not likely that this program will be altered, unless the slight quota of orders which the small mills have at this time should be still further curtailed. All in all, the outlook for the entire steel industry is growing brighter and slow gains in orders are looked for by even the most confirmed pessimists of a few weeks ago.

Pig Iron.—With sales of retail proportions, values continue plastic. Malleable has been sold at $21.50, Buffalo, furnace.

Steel.—The full-finished sheet price, in keeping with the general reductions on sheets, is now at 4.70c. for 22-gauge autobody stock. Full-finished sheet makers in the Youngstown district have a fair amount of orders on hand. Some inquiries for strip steel have been put out by Detroit passenger car builders. Prices for hot-rolled and cold-rolled strip steel appear to be still in the making. Inquiries for bolts and nuts are more numerous in spite of the fact that most of the passenger car builders are reported to have large stocks on hand.

Aluminum.—So far market quotations have not been assisted in the least by the possibility of the tariff on aluminum being adopted as recommended by the Ways and Means Committee. Consumers appear to incline to the view that the aluminum schedule will come in for so much criticism in the House that it will be altered.

FINANCIAL NOTES

Timken-Detroit Axle Co., in a comparative balance sheet as of Dec. 31, shows assets for 1920 as $21,494,863, as compared with $22,697,214 for 1919. Cash on hand Dec. 31 is shown as $671,151 and inventories total $10,932,521. The cash position represents a reduction of about $800,000 from the year previous and the inventories are about $700,000 more. The company's surplus is $9,866,662, as compared with $10,175,580 in 1919. A $100,000 reserve for contingencies is set forth.

Firestone Tire & Rubber Co., in a comparative balance sheet as of Oct. 31, shows total assets of $107,404,200, as compared with $73,753,598 in 1919. In the 1920 balance inventories are set out as $45,163,710, an increase of $21,000,000 over 1919. Cash and government securities total $5,198,060, approximately the same total as the year before. A surplus of $33,880,757, depreciation reserve of $8,098,495 and $8,151,750 reserve for inventory loss are set forth.

Herschell-Spillman Motor Co., in a comparative balance sheet as of Dec. 31, reports assets of $3,857,452 as compared with $2,409,297 for the year previous. Cash is set forth as $120,337, and inventories $1,402,318. The inventory total for the year before was $553,003, and the cash $586,798. The surplus for 1920 was $35,527 as compared with $71,610 for the year before. Reserves are carried totaling $122,819.

Lee Rubber & Tire Corp. reports current earnings running well ahead of dividend requirements. Decreased production records for the first quarter of the year have been followed by record production in the second quarter, which is continuing. Total bank debt is declared to be $500,000 and cash on hand is said to exceed that amount. Inventories are declared to be normal.

Buda Co., in a comparative income account dated Dec. 31, shows gross sales of $8,721,884 for 1920, as compared with $7,432,287 in 1919. Net income for 1920 was $329,261, as compared with $405,789 in 1919. The balance sheet dated Dec. 31 shows total assets of $5,826,617, in which inventories total $2,413,840 and cash $309,778. Surplus and undivided profits total $1,834,905.

Falls Motor Corp., in a balance sheet as of Sept. 30, 1920, shows total assets of $3,461,256, in which is included cash of $161,303 and an inventory of approximately $800,000. The surplus of the company is $35,933. Accrued dividends total $98,210, accrued wages $15,796 and accrued taxes $41,544.

Kelsey Wheel Co. reports business at a rate which indicates earnings on a par with the $1,916,000 net profits of 1920. The balance sheet as of Dec. 31 showed total assets of $22,680,911. The company is supplying the Ford Motor Co. with a large part of its wheel requirements.

Mitchell Motors Co., in a comparative balance sheet as of Dec. 31, shows assets of $8,846,208, as compared with $8,667,794 for 1919. Cash is shown as $82,339 and inventories as $5,188,761. The company's surplus is $3,952,129 and reserve for contingencies $142,750.

H. H. Franklin Mfg. Co. paid a dividend of 50 cents a share on common stock on July 11. Forty per cent of employees are now stockholders. Profits for the first five months of 1921 are estimated to be in excess of $775,000 after taxes.

Wright Aeronautical Co. reports orders ahead, which indicate a gross business for the year in excess of $2,500,000, and declare earnings will approximate $1.88 a share, as in 1920, after charges and allowances for development expenses.

International Harvester Co., through Vice President Legge and Treasurer Ranney, declare the company is not contemplating any new financing. Not much change in the affairs of the company in a monetary sense is expected this year.

Fisk Rubber Co. directors have deferred action on dividends on both first and second preferred stock. The last disbursement on the second preferred stock was 1¾ per cent on June 15, and on first preferred 1¾ per cent on May 1.

Ajax Rubber Co., Inc., through its board of directors, has declared that no new financing is contemplated and that the company was in no need of additional funds. The business outlook is reported better than for months.

Republic Motor Truck Co., Inc., in an income account for the March quarter, shows net sales as $797,163, profit after sales costs of $143,778, gross income of $174,163, and a deficit after expenses, charges, etc., of $367,808.

Fisher Body Corp. has declared a dividend of 1¾ per cent on its preferred stock, to be paid Aug. 1. A dividend of $2.50 a share will be paid at the same time on the no par common stock of the company.

United States Rubber Co. has passed payment of the quarterly dividend of common stock due at this time. The regular quarterly dividend on the first preferred will be paid July 30.

Wright-Fisher Bushing Corp. has gone into receivership, the Security Trust Co. of Detroit being appointed to take over the affairs of the company.

Hale & Kilburn Corp. report American Body Corp. sales from Aug. 11, 1920, to Dec. 31, 1920, as $8,523,875. Net income after all expenses was $269,457.

Hupp Motor Car Co. declared the regular quarterly dividend of 2½ per cent on the common stock, payable August 1 to stock of record July 15.

Electric Storage Battery Co. has declared regular quarterly dividends of $3 on both the common and preferred stocks, payable Oct. 1.

Federal Rubber Co. has omitted the quarterly dividend of 1¾ per cent on first preferred stock due at this time.

Toledo Plants Re-employ 8288 Men During June

TOLEDO, July 15.—The employment situation in Toledo has been greatly relieved in the last month mainly by the awakened activity at the plants here which are associated with the automotive industries. Out of 26 cities of the country showing a gain, Toledo was third, with 15.6 per cent betterment in June.

The report of the Merchants' and Manufacturers' Association here shows that during the month Toledo plants requisitioned 13,738 men, of whom 8288 were vehicle workers, and most of them taken back to work by the Willys-Overland Co.

In addition to this number of automobile men there were put to work 485 textile workers, 1533 iron and steel workers, 1987 clay, glass and stone workers and 1408 miscellaneous employees.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, July 12—The reserve ratio on the Federal Reserve System declined slightly from 60.8 per cent to 60 per cent. This was largely a result of the $37,441,000 increase in Federal Reserve notes in circulation, as well as the $27,364,000 increase in deposits. Gold reserves increased $15,875,000 and total discounts $29,801,000.

Money was in somewhat larger supply on the local money market last week following the mid-year disbursements. Call money had a slightly narrower range at 5½ per cent to 6 per cent, as compared with 5 per cent to 6 per cent the previous week. The ruling rate was 5½ per cent although on the "outside" market some trades were made at lower rates. The larger supply of funds also had an effect on the quoted rates in the time money market. Six per cent was quoted for all periods from 60 days' to 6 months' as against 6½ per cent for 60 days' and 4 months' paper and 6 per cent to 6½ per cent for 5 and 6 months' paper a week ago. The market, however, was quiet and transactions were not made on a large scale. In the commercial money market 6¼ per cent to 6½ per cent was quoted for 60 and 90 days' indorsed bills receivable and 6 months' prime bills as against previous rates of 6½ per cent to 6¾ per cent.

The significant feature of the industrial world last week was the action of the United States Steel Corporation in reducing prices, following the lead of the Bethlehem Steel Corporation. The two price reductions now made since April by the Steel Corporation from the price maintained from March 21, 1919, to April 12, 1921, the level established by the Industrial Board, range from $8 to $25 per ton for steel products. The present prices are now about 29 per cent below the "Government prices" during the war, and 17 per cent below Secretary Redfield's Industrial Board prices. In addition, the Steel Corporation also abolished the time-and-one-half wage scale for overtime work. These two decisions should have a beneficial effect toward putting the steel industry on a readjusted basis. The industry is now working much below normal as compared with the general level of activity in the industrial field throughout the country. The present rate of operation was estimated to be about 20 per cent of capacity.

SPEED REFINANCING PLANS

NEW YORK, July 12—Marked progress in the plans for refinancing the Willys-Overland Co. were made at a meeting of the bankers' committee today. It is expected that details of the plan will be announced in the near future. The basis of the refinancing plan will be the issuance of first mortgage bonds, the proceeds of which will be used to take up the floating debt.

MEN OF THE INDUSTRY

Charles Hendy, Jr., identified for the past fourteen years with the Ford Motor Co., has announced his connection with Simplex Corporation of Chicago, manufacturers of Theftproof Auto Locks. Mr. Hendy was for many years in charge of the Denver plant of Ford Motor Co., and for the past two years has been manager of the Chicago plant. He acquires a stock interest in Simplex Corporation and becomes vice president and general manager. To date, Simplex Corporation has devoted its output to extra locks, but under Mr. Hendy's management will actively push its factory type lock for standard equipment.

A. G. Seiberling of the Haynes Automobile Co. at Kokomo, Ind., has been named chairman of the special committee of the Kokomo Chamber of Commerce to co-operate with the board of directors of the Howard County Automotive Trade Association in putting on an automobile show and industrial exposition next September. At a meeting of the Automotive Trade Association results of the co-operative used car market, which was held recently, were discussed. So successful was the market that it has been decided to hold another some time the latter part of July or the first of August.

Albert R. Erskine of South Bend, the managing head of the Studebaker corporation, has been named as one of the members of the interstate harbor commission of Indiana and Illinois, created by an act of the last session of the General Assembly. The commission is to investigate the feasibility of the construction of a proposed interstate harbor in Lake Michigan in the Calumet district of Indiana and the Chicago district of Illinois. Two members are to be appointed by the Governor of Indiana, two by the Governor of Illinois and one by the Secretary of War.

C. P. Raney, who has been assistant manager of the Miller Tire Repair School since June, 1919, has accepted a position as Akron branch manager for the Western Rubber Mold Company. Mr. Raney has had nine years' experience in the rubber industry. In 1913 he was tube inspector of one of the Akron companies. This work was followed by a position as department foreman. He later became an industrial engineer for another of the large tire companies.

Frederick C. Horner, formerly transportation engineer of the Packard Motor Car Co. of New York, has sailed for England, where he will spend a year studying various transportation matters. He will make London his headquarters during his work abroad, and plans to spend some time in Scotland and on the Continent. He intends particularly to study carefully the operating program of the London General Omnibus Co.

Mr. Robert D. Black, who was formerly assistant sales manager of The Black & Decker Mfg. Co., of Towson Heights, Baltimore, Md., has been appointed manager of the company's Philadelphia branch office. Mr. Black succeeds Mr. W. C. Allen, who has been made a special factory representative, with headquarters at the Company's Cleveland Branch Office.

Herschel C. Smith, formerly deputy state highway engineer of Oklahoma, has been appointed assistant professor of highway engineering and highway transport at the University of Michigan, from which institution he graduated in 1913. Last June he received the degree of Master of Science in Highway Engineering and Highway Transport.

F. W. Fenn, secretary of the motor truck committee of the National Automobile Chamber of Commerce, has gone to Canada for a three-weeks' vacation, after a month's trip through the Middle West, in which he visited many truck plants which are non-members of the chamber.

H. L. Dunn, purchasing agent for the Handley-Knight Co., has tendered his resignation, to take effect Aug. 1. He has not announced his plans for the future.

Charles L. Derrickson, of the McQuay-Norris Mfg. Co., St. Louis, has been discharged from the hospital after a serious illness of four months.

INDUSTRIAL NOTES

Franklin Automobile Co. announces that from January 1 to June 30 it produced and sold to dealers 5382 cars having a retail value of $17,784,000. This represents 82 per cent of the number turned out and sold during the corresponding period last year. In June 1038 cars were shipped. On June 24 the production schedule was increased from forty cars daily to forty-three.

Lincoln Motor Co., starting with fifteen distributers in November, 1920, has increased the number of distributers and dealers to 138. Sales reflect the contracts. Each month of the second quarter has bettered the entire first quarter's business.

Rhode Island Machine & Tool Co. of Woonsocket has been licensed to manufacture high pressure greasing devices under the Bassick patents, and patent litigation between the two companies has been withdrawn.

Samson Tire & Rubber Corp., Los Angeles, is operating on a 24-hour daily schedule to meet heavy sales demand for its product.

Root and Van Dervoort Corp. produced 450 cars in the first half of the year, as compared with 767 in all for 1920.

N.A.C.C. Directors Get Reports on Activities

BUFFALO, July 13—Several subjects of interest to the industry were discussed by directors of the National Automobile Chamber of Commerce at a meeting here to-day at the Hotel Lafayette. One of them was a greater degree of co-operation with automobile dealers throughout the country. In this connection a report was made on the conference held here yesterday between committees representing the N. A. C. C. and the National Automobile Dealers' Association.

Directors were asked to adopt a definite plan for co-operation with Secretary of Commerce Hoover in assembling industrial statistics and promoting foreign trade.

The directors also took up the program for promoting "safety first" plans on a national scale including the use of a $5,000 fund to be given in prizes to school children for essays.

Alfred Reeves, general manager, stated that reports submitted at the meeting showed that the automobile business is 10 per cent better off than any other industry.

Directors who attended the meeting were R. E. Olds, Charles D. Hastings, Alvin Macauley, A. J. Brosseau, John N. Willys, H. H. Rice, H. M. Jewett, W. L. Pulcher, Thomas Henderson, J. Walter Drake, W. E. Metzger, Roy D. Chapin and C. C. Hanch.

Detroit to Have Annual Convention of M.A.M.A.

NEW YORK, July 12—This year's credit convention of the Motor and Accessory Manufacturers' Association will be held at the Hotel Statler, Detroit, Wednesday, Thursday and Friday, Sept. 14, 15 and 16. Tentative plans call for a comprehensive and vital program of papers and discussions, built around the central theme: "Bringing the Automotive Industry Back to Normal."

Detroit was selected this year because of its convenience to the great majority of the 400 companies affiliated with the association. Speakers of national importance from the automotive industry and from industrial, banking and governmental circles will be scheduled for the program. The annual credit convention of the M.A.M.A. is usually regarded as one of the industry's most significant gatherings, for there the credit managers, financial directors and general executives of the unit and equipment manufacturers exchange comments and experiences on current conditions and future prospects for the automotive field.

Rubber Association Men Study Proposed Tariff

NEW YORK, July 12—General Manager A. L. Viles of the Rubber Association of America will take up immediately with President Harry T. Dunn and directors of the association, a study of the 10 to 35 per cent duty on tires proposed in the permanent tariff measure now before Congress.

Probable effect of the proposed increase of 25 per cent in the duty on foreign made tires will be discussed and a policy determined upon. Though it is recognized that no high tariff protection is needed now, Viles said there were some tire makers who thought competition would develop as production methods improved abroad.

Probability of retaliatory action by importing countries will be considered as having an important bearing on the future of the tire industry in this country, Viles said.

AUTOMOTIVE CORPORATION SUED

TOLEDO, July 15—Ten residents of Cleveland filed suit in Common Pleas Court here this week to recover money paid to the Automotive Corporation for stock. They claim that false representations were made by agents of the company.

Calendar

SHOWS

Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair, conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.

Sept. 28 - Oct. 8 — New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.

Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.

January — Chicago, Automobile Salon, Hotel Drake.

Jan. 7-13—New York, National Automobile Show, Madison Square Garden, Auspices of N.A.C.C.

Jan. 28-Feb. 2—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.

FOREIGN SHOWS

September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park; Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Sept. 23-Oct. 2—Berlin, German National Automobile Show, Auspices of German Automobile Mfg. Ass'n and German Automobile Club.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

CONVENTIONS

Sept 14-15-16—Portland, Ore., Credit Convention Motor and Accessory Manufacturers Association.

Oct. 12-14—Chicago, Twenty-eighth Annual Convention National Implement & Vehicle Ass'n.

Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.

Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.

RACES

July 25—Grand Prix, Le Mans.

Labor Day—Uniontown, Pa., Autumn Classic.

Bosch Magneto Adds Battery Ignition System

BRIDGEPORT, CONN., July 12—The American Bosch Magneto Corp. has announced the addition to its line of electrical equipment of a battery ignition system. This system is not intended to displace the magneto ignition system, which will be continued, but to supplement and complete a line which, according to the announcement, is intended to satisfy every electro-mechanical need of the automotive industry.

The battery ignition system comprises a timer-distributor and a coil. The distributor is made in two types, the so-called "compensating" or automatic advance type, and a type suited for manual control. Both systems are provided for 4, 6 and 8 cylinder engines. The coil, arranged for mounting on the engine side of the dash or on the engine, as desired, is inclosed in a tubular case with molded ends, and is assembled with a single through bolt in the axis of the coil. The coil is said to be dust- and waterproof. A ballast coil is provided to adapt the system for operation on either 6 or 12 volts.

Fort Wayne Druggist Buys Rubber Company

FORT WAYNE, Ind., July 12.—David S. Vesey, trustee in bankruptcy, has accepted the bid of $90,000 cash made by Henry J. Bowerfind, president of the Fort Wayne Drug Co., for the property and equipment of the bankrupt Fort Wayne Tire & Rubber Mfg. Co. The bid will now have to be accepted by the referee in bankruptcy.

Several other bids were made for the property at the trustee's sale. Among these was a bid of $90,000 by the stockholders of the concern, but as this bid was for part down and the rest on time payments the bid was not accepted. A Chicago concern bid $95,000 on time for the plant and a Cleveland company $110,000 on time, but these bids were also turned down because of the time element in the payments.

The total indebtedness of the local concern is about $200,000, outside of the amount put in by the stockholders, of course. The total appraisement of the property, including claims, was $263,000. The plant owns two and a half acres of ground and a three-story, 100 by 150 ft. building. The building and land were appraised at $160,000 and the equipment at $100,000.

The appraisement is considered quite high on the basis of present costs. The machinery and stock were purchased at a time when prices were highest and the building was erected during the era of high building costs.

The sale is considered a pretty good one from the basis of creditors as the amount realized will allow the concern to pay creditors about thirty-three cents on the dollar. Recently a tire plant at New Castle was sold by the referee in bankruptcy and it paid the creditors only twenty cents on the dollar.

GOODYEAR RUBBER IS SUED

BOSTON, July 11—Suits were entered in the Federal Court here to-day against the Goodyear Tire & Rubber Co. of Akron, Ohio, alleging infringement of patent rights in the manufacture of certain automobile tire treads. The treads are alleged to be copies of a wheel invented some years ago for use on street railways to break up snow and ice.

The plaintiffs are Catherine M. Moyglan, administratrix of the estate of John A. Casey of Newburyport, inventor of the street railway wheels, and Emil H. Daniels, of Tampa, Fla. The court is asked to restrain further production of the treads and to assess damages covering the past six years.

INVENTS ROTARY VALVE ENGINE

NEW YORK, July 11—Eugene Bournonville, the head of the Bournonville Welding Co., one of the pioneers in the development of welding, has invented a rotary valve engine and has manufactured about half a dozen of these at a plant in Hoboken, N. J. It is understood that Bournonville will also manufacture a car in which this engine will be used and the car will be known as the Rotarian. The company will manufacture under the name of the Bournonville Rotary Valve Motor Co.

Durant Gives Contract to Continental Motors

DETROIT, July 13 — A contract for several thousand four cylinder engines for Durant Motors, Inc., has been placed with the Continental Motors Corp. Work on their construction will be started Aug. 1. The Continental plant now is being tooled for production of the motors which will be of a special type. The output will be increased steadily until it reaches 150 a day. The motors will be shipped to the Durant plant in Long Island City, the factory under construction at Oakland and the main plant in Lansing.

It is understood that negotiations have been virtually completed by Durant Motors for its supply of axles and frames although contracts have not been formally signed. The axles probably will be made in Detroit and the frames in Milwaukee.

Plan Two Tractor Shows in the West This Winter

CHICAGO, July 12—Definite decision to hold a tractor show in Minneapolis, Jan. 30 to Feb. 4, inclusive, and to hold a show week in Kansas City during the winter, was made by the national demonstration and show committee of the National Implement & Vehicle Association at a meeting here to-day. The Kansas City event will not be held in any central building but each manufacturer will convert his Kansas City headquarters into a display room with general co-operation in publicity and other features to attract visitors into the city from the Mid-West agricultural territory.

URGE A. E. F. TRUCK PROTEST

NEW YORK, July 11.—The National Automobile Chamber of Commerce has requested members to communicate with the House Ways and Means Committee at Washington, urging approval of the Graham resolution. The resolution imposes a 300 per cent duty upon reimported material originally designed for use by American Expeditionary Forces.